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VIEWS, NEWS AND INTERVIEWS.

Among the lecturers for the coming year at the Massachusetts Institute of Technology are the following: Geo. W. Blodgett on "Applications of Electricity to Railway Working;" Anthony C. White on "The Distribution of Electricity for Commercial Purposes;" Hammond V. Hayes on "Telephone Engineering;" J. P. B. Fiske on "Construction and application of Electro Motors."

Benjamin Franklin, writing to M. Leroy, of the French Academy of Sciences, in 1789, said: "Our constitution is in active operation. Everything appears to promise that it will be successful. But in this world nothing is certain but death and taxes." It may not be generally known that Franklin originated this now familiar expression, "Nothing is certain but death and taxes."

Professor de War, in studying the relations of oxygen and magnetism, lifted a saucer full of the gas liquefied by a magnet, the liquid remaining fast to the poles until dissipated in the original form by the heat of the metal.

Judging from the preparations now being made, 1892 will be a wonderfully successful year for manufacturers of electric street railway apparatus.

A Brazilian senator has proposed that the legislature of the new republic dispense with the services of the shorthand reporters and use Edison's phonograph to record and report the speeches of the members. But some far-seeing statesmen are strongly opposing the proposition. They fear greatly, and naturally, for the nation's reputation for eloquence, and dread the general result of having the speeches of senators and representatives reported exactly as delivered. They readily acknowledge how much is due to the reporters for fixing up in good shape the speeches delivered in the legislative halls and elsewhere. It might, indeed, be said that very few men would like to have their speeches printed exactly as they deliver them.

According to the *National Zeitung* a company has been organized in Hamburg to forward persons by pneumatic tube from Hamburg to Boshen, about 15 miles. The distance, it is expected, will be covered in 11 minutes. The tube will be made by the famous Mannesmann process, and will carry a car about seven feet wide and three and one-half feet long, capable of holding three persons.

A grand celebration of the partial opening of the big Niagara Falls tunnel occurred there on Christmas eve. All day the drillers in the portal shaft, which opens on the river bank below the falls, could hear their comrades in Shaft No. 1 at work with the compressed air drills. The final blasts were made at six o'clock, and an hour afterward the contractors, Messrs. Rogers & Clement, walked through the headers and over 4,000 feet of the tunnel was open. The tunnel men shouted, and a gala time followed. Prior to the final blasts, a hole was drilled between the two sections through the solid rock and congratulations shouted back. The calculations of the engineers were most accurate, as the two ends came together at exactly the same place. Contractor Rogers fired the final blast by electricity. It was the heaviest in the course of the construction of this big undertaking, and was distinctly felt in the village, although over 200 feet of solid rock intervened. There are about 600 feet yet of rock between Shafts No. 1 and No. 2, which the drillers are fast demolishing and expect to finish within a week or ten days. This will practically throw open the whole tunnel, except a few feet near the canal. It will all have to be bricked in, and work on that will begin in February.

A banquet for 26, which cost $4,000, was recently laid at the Manhattan Athletic Club, New York. One of the most delightful features of the banquet was the liberal way in which electric lighting effects were used. Two hundred and twenty-five incandescent lamps were used in various devices. The globes of these were all covered with fine transparent silk in delicate shades, making the interior of the apartment a veritable fairyland. A huge illuminated triangle with the corner broken was the device which typified the consummation of the compact entered into by the three friends who gave the dinner. Suspended from the center of the ceiling was a lamp of 200 candle-power, which shed a soft, mellow light over the scene.

Justice—"Young man, do you understand the nature of an oath?"

Boy—Yes, sir. I used to be telephone boy at central office."—*The Comic.*

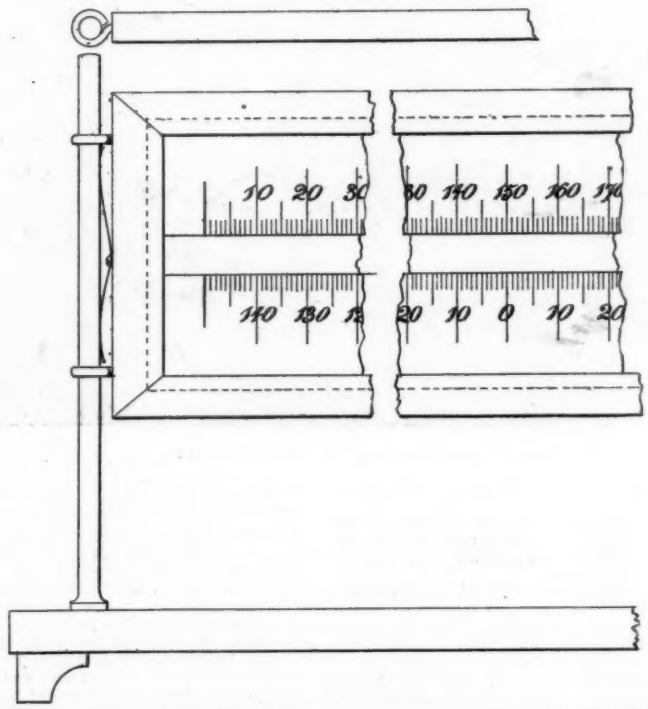
Carrying Electricity Into Africa.

A rather thick set, heavy built man, evidently a Scotchman by birth, was on the floor of the Builders' Exchange on Tuesday on an errand that will interest not only the business men of this city, but aid in the introduction of a thorough electrical system in the dark continent, Africa.

The gentleman was William Malcolm, of Cape Town, South Africa, and he is here to gain information necessary to the construction of an electric railway in that far off land.

It is his purpose to secure from the merchants and manufacturers information on dynamos, motors, storage batteries, the trolley system and other methods of electrical locomotion. All of the various plants of this description in Philadelphia will be visited and statistics carefully compiled, which are to be presented to the syndicate represented by Mr. Malcolm.

At the present time nearly all of the attempts to introduce electrical apparatus in Africa have been under the direction of Germans, and it is the purpose of the syndicate to use all American articles, as far as possible. An important epoch is to be marked in the history of Africa by the introduction of more advanced methods than have heretofore existed in that country. Owing to the monopoly of electrical goods held by the Germans, exorbitant prices have been charged. The only method of lighting now is by gas, which is entirely inadequate to the demands, often leaving the town in semi-darkness. For these reasons, Mr. Malcolm has been instructed to have interviews with all the leading electricians of the city. —*Philadelphia Inquirer.*



PRACTICAL NOTES ON THE REFLECTING GALVANOMETER.—TRANSPARENT SCALE.

PRACTICAL NOTES ON THE REFLECTING GALVANOMETER AND ITS ACCESSORIES.

BY J. D. BISHOP.

VII.

THE SCALE.

The scale most commonly used with a galvanometer consists of a paper millimeter scale fastened on the front of the lamp stand. The observer, therefore, has to stand between it and the galvanometer and view it sideways. The divisions are very fine and their numeration in small figures makes continued observation very trying.

As usually fixed up, it is often very difficult to find the spot and still more difficult to fix the sight on the hair line if the spot is provided with that refinement. Besides this the scale becomes dirty and brown with age and use, which renders the spot still feebler and reading a pure matter of experience.

It is much easier to have the scale directly in front of one so arranged that a glance beneath or above it falls direct on the mirror so that everything is in a line and open to observation without necessity for the observer to turn his head for any purpose either to right or left. Time will consequently be saved and fatigue much reduced if the operator makes his own scale after the following manner.

I will premise that divisions on a galvanometer scale are purely arbitrary and absolutely mean nothing. They are simply marks placed at equal distances apart and numbered plainly so as to afford means for noting or subdividing the range of a deflection. They may, therefore, be any distance apart and as we propose to make the scale, one-twentieth of an inch is sufficient. Procure two common mechanical paper drawing scales divided to twentieths of an inch. These will cost you about twenty cents each. If you cannot get twentieths, sixteenths will do equally well. Carefully erase the figures which are two small for easy observation and print in by hand, good solid black figures at every fifth division beginning half an inch from the left hand end of the scale with 0, and continuing 5, 10, 15, 20, etc., as far as they will go, but they will be plainer still if only every tenth is figured and the intermediate fifths marked by an extention of the line. Every tenth division also should be extended so as to quite intersect the numbers. Only one of the scales is to be numbered this way and it must be numbered so that the bottom of the figures turn towards the divisions.

The other scale is to be treated in the same manner, but the first division or O is to be in the middle of the scale and the numeration to extend to the right and left and the tops of the figures are to be pointed towards the divisions. Now carefully reduce them both to a regular and straight width of one inch and a quarter, by cutting off the superfluous blank paper.

If regular printed scales are not available, they may be easily made by hand by any ordinary draughtsman, in fact, hand made scales are better, because the divisions may be made blacker and more distinct, absolute accuracy not being so indispensable as with drawing scales. The length of the scale should be eighteen inches. It might well be more but that length is as much as the

eye can conveniently cover without moving the body.

Now procure a piece of clear thin glass, lightly ground on one side only, eighteen and three-eighths inches long and three and three-eighths wide. Have it fixed in a light mahogany frame, half an inch wide and three-eighths thick, with grooves to receive the glass three-sixteenths of an inch deep. The two end pieces of the frame should be of close clean grained wood five-eighths inch wide. Now, at each end of the frame, in a line with its length and at half an inch from each corner, put in two small brass or steel screw eyes whose inside is quarter inch diameter and between them in the middle, screw in with one screw, placed in its center, a piece of spring brass which is bent so that when a quarter inch brass rod is passed through both eyes the spring will press against it with sufficient friction to hold the frame in place. To prevent the spring from slipping away from the rod, its ends may be rounded by a few blows of a hammer, or a V shaped notch filed in each end of the spring will answer the same purpose.

Now provide a piece of mahogany for the base of the scale, 4½ inches wide and 23 inches long, by half an inch thick, in which are fitted two brass uprights. These are to be of rod a quarter inch in diameter and nine inches long screwed into the base. Their distance apart will be about 19½ inches. Place four small feet underneath the base so that it will stand steadily on the table. By this arrangement the frame may be pushed up or down. It will be found to slide easily and smoothly and yet with sufficient friction to remain firmly where fixed. (See sketch on first page.)

Now take the scales and gum them on the ground side of the glass, blank edges of paper next the frame and with the figures upright, which means that the scale numbered from the left will be on top and that numbered from the center will be beneath, which will leave a space of blank glass between them half an inch wide on which the spot will fall.

The glass should fit loosely enough to rattle when laid down. For there is less danger of its breaking than when it is held tightly in the frame.

VIII.

CONDENSING LENS.

Good galvanometer scales are generally provided with a small lens in front of the lamp to concentrate its rays on the mirror, and as with the arrangement we are describing the light radius will be very much longer than usual we shall also require a lens.

Get an ordinary reading glass about ten inch focus and three or three and a quarter inches diameter. Fix it on an overhanging arm made of brass rod or tube bent at right angles and fitting telescopically into another upright tube which is solidly fixed in a heavy leaden base, so that the lens may be raised or lowered as desired. The length of the horizontal arm should be 10 or 12 inches. The handle of the lens may be unscrewed and the screw of its supporting metal rim fitted into the horizontal arm. By sliding the bent arm up or down and shifting the base horizontally the lens may be placed at any desired position necessary to get an exact focus of the lamp rays on the mirror.

This is too simple a matter to require more detailed description. Any respectable optician will let you have several lenses to experiment with. This experimenting may be tedious, but it will be found very interesting and the desired result accomplished will amply repay the time spent.

IX.

THE SPOT.

Next to the mirror the spot is the most important detail in the whole paraphernalia. It should be clear, bright and have sharp well defined edges, and these can easily be secured by so managing the shutters that they stop out all the light from the lamp except a very thin strip in a line with the center of the flame's edge.

The lens may also be easily manipulated so as to move its center a little out of the line of light, in which case the spot will be bright, well defined and sharp on one side, and gradually shaded off to darkness on the other. The deflections should be read off from the sharp side which serves as an index.

If prismatic colors appear on the edge they will in all probability arise from refraction caused by the glass in the galvanometer cover, or perhaps from imperfections in the lens itself. In either case it may be cured by a little manipulation of the lens. Stopping out all the lens except a strip half an inch wide running vertically through its center, will also tend to sharpen a spot and abolish the prismatic colors. The stopping may be accomplished by paper blackened or black varnish.

Good galvanometer lamp scales are provided with a small lens fitted with a fine hair which, when properly focused, throws a black line on the vertical axis of a round spot about the size of a dime. This is a perfect arrangement, but it is too small and fine and trying to the eyes for constant work.

In the arrangement recommended by the author, the spot will show upon a sheet of paper placed at the back of the scale as a broad band of light three to four inches high, and, according to the position of the lens, from one-tenth to one inch wide, but as there is only one-half inch of glass on the scale left uncovered, it will only appear to be half an inch high when viewed from the front.

It will be remembered that in the instructions for making the scale the divisions were to commence half an inch inside from the frame. This is to allow the spot to remain in view at zero if the right hand edge of it is used as an index; but the left hand edge may be used just as well. It is merely a matter of which way you can get it sharpest.

Of course, the lens may be so placed as to give a well defined spot, or rather bright band of light, with both edges perfectly sharp, but one sharp edge, gradually shaded off to darkness, is recommended, because it is then impossible to make an error by reading from the wrong edge. Almost any variation of spot may be obtained by a little manœuvring of the lens.

This spot, provided no light falls direct on the back of the scale, may be read with perfect ease in broad daylight, or with an arc lamp burning a few feet from the front of it. There is, consequently, no strain on the eyesight nor any necessity to keep the eyes close to the screen.

Which zero you adjust your spot to will depend on the work you have to do. For taking the constant or for insulation tests, or any other work requiring a deflection in one direction only, it is best to start from left hand zero, and thus utilize the whole length of the scale.

For work requiring deflections in opposite directions, such as charge and discharge and conductivity tests, of course the center zero only can be used.

If at any time your spot begins to vibrate or tremble, look to your suspension frame. Increase of temperature, which lengthens the springs, or some other cause, has allowed the galvanometer board to drop a little and touch the bottom floor, thus mechanically conveying the vibrations of the room direct to the mirror.

The removal of one of the rifle bullets nearest the point where the board and floor touch will release it.

Sometimes when busily engaged you will find the spot grow dim and colored. Look to your lamp.

Prejudice against Electricity in England.

A most persistent prejudice exists in England to-day against electricity, of course, among the uneducated. A similar prejudice cropped up in this country, but the easy adaptability of the American character to new conditions soon killed it.

Professor Metzger, in a lecture at Hendon, England, recently, remarked on this prejudice and gave as an instance the case of a new central station lately opened up in the neighborhood of his residence. Two of the more strenuous objectors to the station were a milk dealer and a butcher. The milk dealer protested against the new illuminant on the ground that a leak in the mains had made his milk sour, and the butcher insisted that the current escaped and spoiled all his meat.

"C. & C." Dynamos in the St. Nicholas Hotel, Cincinnati, O.

The illustration shows the dynamo room of the well appointed St. Nicholas Hotel, Cincinnati. The two generators have a capacity of 800 lights each and are of the standard "C. & C." type. The fields of the dynamos are compound wound and the entire machine is constructed with a view to attaining the highest possible efficiency. The armature shaft revolves in self-oiling bearings and the whole machine rests upon a sliding base, which can be adjusted to tighten the belt. This installation was made by the "C. & C." Electric Motor Company, New York, about a year ago, and the dynamos have been in constant service since then. The fact that a 40 K. W. dynamo of the same type has recently been added to this plant to furnish power for an increased number of lights gives evidence of the entire satisfaction which these machines have given.

"C. & C." Dynamos in the St. Nicholas Hotel, Cincinnati.

Mr. Howells' New Work.

The announcement that Mr. Howells will leave *Harper's Magazine*, to take editorial charge of the *Cosmopolitan*, on March 1, calls attention to the process of building up the staff of a great magazine. Probably in no monthly has the evolution been so distinctly under the eyes of the public as in the case of the *Cosmopolitan*. The first step after its editorial control was assumed by Mr. John Brisben Walker, was to add to it Edward Everett Hale, who took charge of a department called "Social Problems," subjects concerning which the greatest number of people are thinking to-day. Mr. Hale, who is a student, a fair-minded man, a thorough American and a man of broad sympathies, has filled this position in a way to attract the attention not only of this country, but of leading European journals. Some months later, a department was established called "Review of Current Events." To take charge of this a man was needed who should be familiar not only with the great events of the past thirty years, but who knew personally the leading men of both the United States and Europe who could interpret motives and policies. Murat Halstead accepted this position with the distinct understanding that his monthly review should be philosophical and never partisan. The next step in the history of the *Cosmopolitan*, was the placing of the review of the intellectual movement of the month in the hands of Mr. Brander Matthews, who for some time has been recognized as one of the two or three ablest critics in the United States.

Finally came the acceptance of the editorship conjointly with Mr. Walker, by Mr. Wm. Dean Howells. Mr. Howells, who is recognized universally as the foremost American of letters, upon the expiration of his contract with Harper Brothers, on the first of March, will take in hand the destinies of a magazine which promises to exercise a share of influence with the reading classes of the United States. His entire services will be given to the *Cosmopolitan*, and everything he writes will appear in that magazine during the continuance of his editorship.

A Plucky Engineer's Wife.

Mrs. Colbranson, wife of the engineer of the What Cheer, Iowa, Electric Light Company, while attending to the engine in the illness of her husband, was caught by the dress in the dynamo and whirled so rapidly that she was entirely denuded of clothing and rendered unconscious. She recovered enough to stop the engine and is not seriously injured.

Westinghouse.

It is said that the new Westinghouse electric stock to be issued for the assented stock is likely to be put out in the course of a few days. It is figured that the company is now earning on the basis of $3,000,000 for the year, $600,000 net, or seven per cent. on the $3,000,000 of preferred stock and 6½ per cent. on the $5,000,000 of common, or about 15 per cent. on a price for the new stock, which would be equivalent to 12½ or 13 for the old stock.—*Journal of Finance.*

Telephone and Telegraph Licenses.

Mayor Edwin S. Stuart, of Philadelphia, has favored Mayor Latrobe, of Baltimore, with a communication from Abraham M. Beitler, of the department of public safety, regarding the license fees required by the Philadelphia municipal government from telegraph and telephone companies for permits and poles and wires strung. The liability of the companies is a question which has been in the courts for years. In the county courts the city won. Mr. Beitler says:

"The present status of the cases is that as our home companies cannot get into the United States courts we are endeavoring to collect from them, while the foreign companies, I believe, are not being proceeded against until final determination as to their liability by the United States Supreme Court. The amount now due us for license fees for the last six years is upward of $50,000."

To Retire From Business.

The Equitable Engineering and Construction Co., Drexel building, Philadelphia, announce that on the first of January, their company will go into liquidation.

Their business for the past year has been a profitable one, but the active members of the concern wish to get out of the construction business.

Mr. S. Ashton Hand has accepted a position as superintendent of the Detroit Electrical Works, Detroit, Mich., and Mr. W. A. Stadelman wishes to devote his time for the present to his interests in Bristol, Tenn., which consist of the Bristol Belt Line Railway, and the Bristol and East Tennessee Railroad, in both of which he owns a controlling interest. The company retired from business with every debt paid and a good balance to be distributed as a dividend to the stockholders.

The Missouri & Kansas Telephone Company.

The Missouri & Kansas Telephone Company closed its business for 1891 without owing a dollar and with about $4,000 in the treasury. Besides this the company has $101,000 of cash assets drawing six per cent. The plant is in good condition—better than the average.

At Kansas City the company will ultimately install a new plant.

The company has recently bought a permanent headquarters at Kansas City. It is one of the best buildings in the city, and is located at the corner of Delaware and Sixth streets. A payment of $15,000 has been made on this purchase out of the year's earnings. The company has from five to 12 years in which to pay the balance, with an interest account of from five to six per cent. The rentals would pay for the property if they were turned in as a whole for 12 years.

The prosperity of this company is largely due to the financial ability and management of its president, Mr. J. R. Mulvane, of Topeka, Kan., one of the ablest financiers in the West.

Pittsburgh Electric Club.

The Pittsburgh Electric Club opened its new house, 802 Penn avenue, on New Year's Eve. The invitation cards announced that "open house" would be kept from "12 G. M. to 12 G. N." A large number of members was in attendance, and the new home of the Club was successfully inaugurated.

Boston Electric Club.

In pursuance of the new plans of the Boston Electric Club, a circular has been issued at the hands of Secretary Ross, informing members of an inaugural dinner for the year 1892, to be held at the Parker House, on the 11th inst,, preceded by a business meeting for the election of officers and adoption of the amended constitution and by-laws. Prof. Elihu Thomson and Prof. Cross have accepted invitations to be present, and it is expected that Hon. Francis A. Walker will attend, as well as many other well-known honorary members.

New England Electric Club.

A number of gentlemen interested in the electrical business met at the Tremont House, Boston, the evening of December 28, and formed the New England Electric Club. The following named officers were elected: President, Mr. Ferdinand A. Wyman; vice-president, Mr. E. A. Record; secretary, Mr. Lynn M. Hays; treasurer, Mr. A. O. Smith; board of directors, Mr. Charles C. Pierce, Mr. Maybin W. Brown, Mr. Elmer P. Morris. The officers, with Mr. E. R. Tilton and Mr. James E. Cotter, were appointed a committee on constitution and by-laws, and also to take all necessary steps toward obtaining a charter, and to investigate, consider and report in regard to obtaining quarters for the Club. The Club starts off under most prominent auspices with a membership of 110.

The Franklin Experimental Club.

The Franklin Experimental Club, of Newark, N. J., has changed its regular meeting night from the second and fourth Tuesday of the month to the second and fourth Saturday of the month. There has been a considerable increase in the membership of late, and a committee has been appointed to look for larger and more suitable quarters, the Club having outgrown its present facilities. Among the subjects that have been taken up at the recent meetings are "Induction," "Construction of Transformers and Applications of Alternate Currents," and "Vibratory Phenomena." A series of talks illustrated by experiments are now being given upon the latter subjects by the various members, illustrating in a most interesting way the phenomena of sound, light, heat and electricity, and their co-relation.

New York Electric Club.

The New Year's Eve entertainment at the Electric Club was one of the most delightful affairs that ever took place in that Club. In the absence of President Samuel Insull, Vice-president Charles W. Price acted as chairman of the evening.

Mr. Joseph Howard, Jr., one of the Club's oldest members, delivered an informal, but characteristically witty address, which he called "A Few Plain Words on Journalism." The plain words developed into exceedingly interesting anecdotes of the early days of metropolitan journalism, when telegraphy was young and newspaper work was a constant hustle. Mr. Howard gave a number of anecdotes of Lincoln, the elder Bennett, Raymond and Greeley, and made a strong plea for a clean home newspaper.

The musical part of the programme, which was under the direction of Mr. Theo. Wangemann, was the best that has ever been provided for Electric Club entertainments. Alfred Grunfeld, the famous pianist of the Imperial Court of Austria, almost made the Knabe piano human. His brother, Heinrich Grunfeld, the celebrated violincellist, was superb in execution and feeling. Mrs. Anna Lankow, the first lady who has ever performed before the Club, artistically rendered a number of songs in a sympathetic alto voice. Victor Clodio, a tenor of the Italian Opera Company, also sang with artistic effect.

A Lunch and Punch were served at the close of the entertainment, after which the members gathered about the table and with toasts and clink of glass sang "Auld Lang Syne." Then came hand-shakings and the compliments of the season.

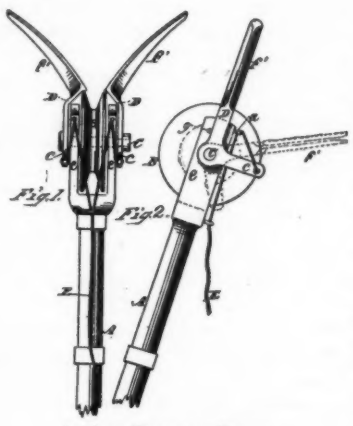
The Electric Club may congratulate itself on the manner in which it disposed of 1891 and welcomed the little stranger, 1892.

A New Trolley Guide.

A very simple but effective invention by which the trolley and arm of electric cars is quickly and surely guided to its position on the overhead wire, whenever displaced by switches or crossovers or when the motion of the car is reversed at the end of a route, is shown in the illustrations below.

It is the joint invention of Benton C. Rowell and Francis E. Galloupe, of Boston.

Time and annoyance is frequently caused by the attempts to replace the small rimmed trolley wheel, failure to do which in time, with the motors reversed, may sometimes cause collisions, and by this device with no change in the trolley arm and by means of the single cord now in use this difficulty to the smooth running of electric cars is obviated.



A NEW TROLLEY GUIDE.

The invention shows three forms or methods of accomplishing the result. In all three the arms automatically fall down below the trolley wheel when not in use, where the guiding cord is slack.

In the first and perhaps simplest form (Figs. 1 and 2) a pair of bell crank lines, one on either side of the wheel, are employed, having one arm of each flaring to readily catch against the wire and so guide the trolley wheel to it. It is operated by simply pulling the cord taut, which, bisecting with two ends which pass through rings and are fastened to the other arm of the bell-crank lines, causes the guide arms to be thrown up in position to form the guide. When the cord is released the guide falls back by its own weight. In answer to the objection that the weight on the end of the trolley arm would be excessive it may be said that guide arms can be made of a light metal or of a tough wood, so that they will not weigh more than one and a half to two pounds altogether, which would have an inappreciable effect upon the trolley spring. A similar method of operating by sliding the arms in a vertical plane, or by sliding on the arc of a circle, accomplishes the same result.

Gas vs. Electricity at the World's Fair.

Recent advices from Hartford, Conn., state that the gas men of the country are not feeling very kindly disposed toward the managers of the World's Fair, and in an effort to patch up the differences, Congressman Lewis Sperry, of the Hartford district, will at once consult with ex-Gov. Thomas M. Waller, of Connecticut, who is one of the Vice-Presidents of the World's Fair. The grievance of the gas men arises from the fact that the Fair managers have made elaborate arrangements for electrical displays, and a magnificent building for this purpose is to be erected, while the gas men are left out in the cold. So the American Association of Gas Engineers has left it to John P. Harbison, of Hartford, to see if the Fair managers cannot be induced to give gas an equal chance with electric lights. Mr. Harbison, who is president of the Hartford City Gas Light Company, is also chairman of the Committee on Gas Lighting of the Association, as well as past president of the Association. He has enlisted the services of Congressman Sperry, who hopes to induce ex-Gov. Waller to champion the interests of the gas men.

Electrical Exhibits at the Columbian Exposition.

READ BEFORE THE CHICAGO ELECTRIC CLUB, JAN. 4, 1892, BY J. P. BARRETT.

Electricity, as an adjunct to industrial procedure has ceased to be empirical. Its practicability, economy and the conveniences of its employment are settled and incontrovertible facts. Its conduct under fixed conditions is no longer problematical. The laws which rule its action are as inviolable as those of the exact sciences, as constant as those of nature, of which they are part.

In making plans, therefore, for an exposition of electrical development, the practical side of the question must be ever uppermost. The chief aim must be to demonstrate beyond cavil that as a factor in the affairs of this work-a-day age electricity cannot but be taken into great account. This, the chief feature, however, would fail of its force were we to neglect to demonstrate at the same time the immense strides that have been made since electricity emerged from a state of mystery and became one of the essentials of civilization and progress.

Following out this preliminary reasoning, I think it necessary to treat practical electricity in classes according to the importance and relationship of its application.

The question of railway and other processes for transporting passengers and freight is the most vital economical issue of the present day. Steam, either by locomotive or cable, has been the only feasible motive power up to within a short time. The manifold objections to it, however, have increased the activity of inventors and the possibilities of rich reward have been a stimulus to the energy of electrical workers. Electricity, in some branches of this service, is already a success, and is fast displacing other motive power. The next few years—possibly the next few months—will probably see the whole question finally settled by some new element or the further development of one or other of the existing electrical systems. It will be part of our duty, therefore, to give every facility to exhibitors to make displays of new systems and to exploit old, along new lines and under new circumstances. In order to do this, it is contemplated to set aside a parcel of ground at some point of the exposition on which to build trial tracks, which may be equipped for the different systems. We should make it possible for every system to be demonstrated, so that not only the electrical people may judge of their respective merits, but that visiting capitalists and possible customers may have ready facilities for becoming interested in the subject itself, or in any of the various inventions or systems on exposition. It is to be hoped that in this class of work the electrical people will submit something which should decide the question of transportation wholly in favor of electricity—as is already in part done—whether it be by means of overhead, conduit or accumulator systems. I have only to say that the public at large and those who are interested in the question from a financial standpoint have high anticipations in this direction, and there is a disposition to wait for developments.

Electric lighting, arc and incandescent, has already arrived at a point of practical success. For illumination purposes electricity is accepted and stands without competition. The developments in this direction will be as thoroughly demonstrated at the Columbian Exposition as it is possible to conceive of. All the various systems of lighting, and of the transmission of power, will be placed in practical operation for service. Nearly, if not quite, 25,000 horsepower will be applied to electrical transmission at various parts of the grounds and buildings. It is contemplated to engage each company undertaking work to wire and equip the *locale* of its distribution, furnish its own lamps, material and supplies, so that each company's system of construction and operation will stand entirely alone, to show its especial merit or to receive condemnation for failure. In this work, it is contemplated

(Continued on page 276.)

Oka, Mont.—Montana Midland Telephone Company; capital, $10,000.

Everett Wash.—Everett Street Railway Company; capital, $50,000.

Elizabeth, N. J.—Non-Magnetic Watch Company; capital, $100,000.

Detroit, Mich.—Electric Supply and Engineering Company; capital, $25,000.

Colchester, Ill.—Colchester Electric Light and Power Company; capital, $6,000.

Jersey City, N. J.—The Micro-Audiphone Company, Limited; capital, $100,000.

Everett, Wash.—Everett Telegraph and Telephone Company; capital, $50,000.

Jersey City, N. J.—International Ore Separating Company; capital, $500,000.

Fairbury, Neb.—Fairbury Electric Light and Power Company; capital, $30,000.

Chicago, Ill.—The Mexican Chemical-Electric Company; capital, $2,000,000.

Kittery, Me.—Municipal Fire and Police Telegraph Company; capital, $250,000.

Akron, O.—The Akron Electric Light, Heat and Power Company; capital, $300,000.

Columbus, Miss.—Columbus Street Railway and Power Company; capital, $25,000.

Princeton, Ill.—The Princeton Electric Light and Power Company has increased its capital from $15,000 to $20,000.

Dixon, Ill.—Dixon Power and Lighting Company; capital, $75,000. Incorporators, F. A. Watson, A. C. Bardwell and F. A. Truman.

Denver and Breckenridge, Colo.—The Breckenridge Electric Company; capital, $20,000. Promoters, Horace M. Hale, Hal Sayr and Irving Hale.

Omaha, Neb.—The Crawford and Fort Robinson Motor Line Company; capital, $50,000. Incorporators, Milo A. Manning, Camp E. Ellis and Leroy Hall.

Pekin, Ill.—Pekin Electric Light and Power Company; capital, $15,000. Promoters, John R. Seibert, George Hergst, Jacob Roelfe, Thomas Cooper and L. Zinger.

Everett, Wash.—Everett Light and Power Company; capital, $50,000. Promoters, Henry Hewitt, Jr., J. F. Plummer, B. J. Rucher, S. Duryee, W. Hewitt and F. Brownell.

New York City.—Sprague, Duncan & Hutchinson, limited, incorporated in Florida; capital, $50,000. To construct, operate and deal in electrical undertakings and securities.

Troy, Pa.—Troy Electric Light and Power Company; capital, $10,000. Directors, Daniel Fleischer, A. C. Fanning, B. B. Mitchell, Frank Loomis and John A. Parsons, Troy.

New York City.—North River Electric Light and Power Company; capital, $200,000. Promoters, Henry D. Fuller, Bayonne, N. J., Robert Maitland, Brooklyn, N. Y., and Henry C. Adams, Jersey City, N. J.

Dolgeville, N. Y.—Dolgeville Electric Light and Power Company; capital, $25,000. Promoters, Alfred Dolge, Dolgeville, N. Y., Edmond R. Wanchel, New York city, and Otto Voight, Dolgeville, N. Y. Incorporation papers sent to Edward W. Brown, Dolgeville, N. Y.

Crown Point, Ind.—Crown Point Electric Illuminating, Heating and Power Company; capital, $60,000. Promoters, Edwin L. Jeffrey, Chicago; George A. Bell, Cobden, Ill; Walter H. Tompkins, Crown Point, Ind. Incorporation papers sent to W. H. Tompkins, Crown Point, Ind.

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In the electrical field the new year opens with bright prospects. Sentiment is optimistic rather than pessimistic.

Be careful, good electrical people, in your efforts with the pen just now. It may cost you several dollars if you allow the usual human frailties to become apparent and keep on writing '91 for '92.

A gentleman of our acquaintance, having just returned from a short trip to Washington, D. C., informs us that some 200 more employés of the census office have recently been furloughed without pay, awaiting a new appropriation. We trust this may not interfere with the working of the electrical division, as it would doubtless be dropped and not taken up again if now cut off. The work already done will be of unquestioned value if allowed to be finished, even though it embraces but one State in full.

The address on the electrical exhibits at the Columbian Exposition, by Prof. J. P. Barrett, chief of the department of electricity, is of a practical character. Professor Barrett's ideas on this subject will doubtless be read with great interest.

The electrical field is fortunate in being free, in a certain sense, from the usual post holiday reaction noticeable in other lines of industry. Electrical development, in its practical aspect, is more affected by the seasons and the state of the money market than anything else.

One of the greatest needs of this United States of ours is a permanent industrial census bureau. What an American really wants he generally gets. An organized effort is all that is necessary to secure a permanent census bureau. What better place to begin such a movement than right here in the great and growing electrical industry?

The electrical inventor is ever at work. Under the head of "Progressive Electrical Inventions," the REVIEW frequently presents interesting and instructive accounts of a number of important patents of recent issue. When we consider the amount of work done by hundreds of ingenious minds in this field, the progress constantly being made is no longer a matter to cause surprise.

The New Year's Eve entertainment at the Electric Club was highly creditable to the entertainment committee who provided it. If there is any one member of the Club who is always sure of a large and appreciative audience it is that veteran, true blue, American journalist, "Uncle Joe" Howard. The excellent musical programme was a real treat. The Grunfeld Brothers received a complete ovation. The Club's famous silver punch bowl was as useful as ever.

The year just ended has not been without its trials in the commercial side of the electrical industry; yet the result will be beneficial, and 1892 will begin with electrical institutions of merit, more strongly entrenched, with better promise of future progress, than at any time in the past. The electrical business is to-day on a more solid and sensible basis, we are convinced, than it has ever been and we expect to see great strides made in it during the next 12 months, both commercially and scientifically.

Ships at sea are seldom struck by lightning now. The explanation is to be found in the general use of wire rope for rigging, as well as in the fact that the hulls of ships are now usually constructed of iron or steel. The ship thus forms an excellent conductor, by means of which the electricity is diverted into the ocean before it has time to do serious damage. It is remarked that wooden ships rigged with ordinary rope rigging still show the same percentage of casualties as formerly.

QUALITY TELLS.

The electrical supply business has about reached that point where the greatest demand will be for goods with merit at a correspondingly meritorious price. The policy which will be adopted will be similar, we predict, to that of the clothier who advertised his wares frankly:

"This overcoat is worth $12. My price is $12."

The days of the persuasive and silver-tongued salesman, who advocates a cheap article at a ridiculous price, are numbered.

The electrical business is now sufficiently advanced for those interested in it to realize that "Quality tells." Flimsy work is never cheap at any price.

Electrical people will do well to impress upon their customers the necessity for having things last. Between excess of first cost and the repair account there is a wide margin. This is worth saving. If you can show a man where you can save him money, either now or in the future, you have made a friend and a customer who will stick to you.

THE TROLLEY IN BROOKLYN.

Mayor Chapin's failure to approve the resolutions of the Brooklyn Board of Aldermen giving franchises to the four leading surface railroads to substitute the electric trolley system for horse power, left the subject in a somewhat muddled condition for his successor, Mayor Boody. The resolutions were adopted on December 21, but were not laid before Mayor Chapin until December 23. The Mayor has 10 days to consider such resolutions, and on his failure to act within that time they become law. As Mayor Chapin did not approve or veto the resolutions, they would have become law within the 10 days' limit at midnight, Saturday, January 2, in case Mayor Boody did not meanwhile disapprove of them.

On Saturday, January 2, Mayor Boody, consistent with his previous objections to the trolley system, exercised his vetoing power and condemned the resolutions.

At a meeting of the Board of Alderman held Monday, January 4, Mayor Boody presented his annual message, and in addition transmitted a separate message vetoing the trolley system. Mayor Boody said:

"The fact that my predecessor in office, with his larger knowledge of the results which would follow their adoption, did not affix his signature to the resolutions, may well increase my appreciation of their importance and my doubt concerning their beneficial effect.

"It certainly is our duty to encourage those enterprises which will increase the comfort and convenience of our fellow citizens and promote the prosperity of our city; but there are features of a grave character connected with the privileges which the said resolutions grant.

"First. While it may be shown that the proposed method for propelling street cars is in successful operation in certain cities of the country, it cannot be said that any city of the size of the city of Brooklyn has felt justified in adopting that system.

"Second. The resolutions grant important privileges which impose new conditions on our citizens, but for which the city receives no equivalent.

"Third. It is claimed that the proposed system is dangerous to life. While it is true that we are called upon to yield many of our personal conveniences for the public good, no citizen in the time of peace can be justly asked to hazard the loss of life or limb. No amount of material benefit can compensate for the loss of one life."

Under the rules of the Board, action upon the veto will not be taken until the next meeting. Enough votes, it is thought, will be forthcoming to pass the resolution over the Mayor's veto.

The biography of Wheatstone, published in the REVIEW recently, contains a very suggestive and useful hint to parents and educators. Wheatstone appears to have been a very dull boy at school, and a lazy boy when placed in a shop to learn a trade, but his father indulged him when he saw that the boy had a passion for reading all kinds of books. It looks as if this passion of the boy was an instinct to find out the direction in which his mind was best adapted to proceed. In a similar way boys often by some natural impulse indulge in various kinds of movements of a gymnastic sort, unconscious themselves that the proper development of their body calls for it, while they are scolded for it and ordered by old people to sit still.

It was well that the boy's father indulged this passion for reading and let him follow his inclination, because if he had compelled him to learn lessons in school or to work at tasks distasteful to him, and had prevented his reading, the boy would never have come to anything. It would have stifled his hidden intellectual yearnings, which lay in an entirely different direction, and the boy would have grown up dull and lazy as he really was in the eye of his teachers and employers. Question: How many boys have such a fate by injudicious compulsion?

When this boy at last found the channel in which his mind was able to travel forward, he followed it and became one of the most eminent men chiefly in the field of electricity, which, as all experienced investigators concede, offers a most rich and inexhaustible realm for progress in the greatest imaginable variety of directions, and always gives a loop-hole to overcome any difficulty or solve any problem which may present itself.

CORRESPONDENCE.

OUR BOSTON LETTER.

Secretary E. I. Garfield, of the Thomson-Houston Electric Company, has recovered his health and was busy with the multiplicity of business details at his office to-day.

Mr. W. F. Fowler, formerly of the North American Construction Company and more recently of the Southern Electric Light and Power Company, Philadelphia, Pa., has joined the force of H. C. Hawks, electrical engineer, 620 Atlantic avenue, Boston, Mass. Mr. Fowler has had a wide experience in electrical matters, and will be a valuable assistant to Mr. Hawks in his rapidly increasing business.

Mr. H. C. Hawks, electrical engineer and contractor, 620 Atlantic avenue, Boston, Mass., reports a very active business just now. He is installing a 650 light central station plant, at Dover, Me.; a 750 light central station plant at Walton, N. Y., where he will put in about 100 street lights; an 85 light isolated plant at Ashuelot, N. H.; a 250 light plant at Miller's Falls, Mass.; a 100 light plant at Blackstone, Mass., and is adding 400 more lights to the large plant of the Hopedale Machine Company, at Hopedale, Mass.; this making over 1,400 lights which he has put in the shops of that company.

Lecture before the Society of Arts.—At the Institute of Technology last night Mr. Francis R. Hart, of the Massachusetts Electric Engineering Company, presented before the Society of Arts a very interesting paper on "Long Distance Transmission of Power by Electricity." Mr. Hart's paper dealt not so much with theory as with practical considerations which come in to influence engineers to put up power stations at points more or less distant from the places where such power is to be used. Frequently, in large cities, it is much more economical to have large central stations, furnished with large boilers and engines, and to have the power delivered over wires, rather than to have it developed by engines on the spot where it is to be applied. One great advantage of the ability by electrical means to transmit power long distances, however, is that it permits the utilization of water power. Economical transmission of electrical power for very great distances requires very high voltages, so that, at present, it is a rather dangerous operation.

Electric Railroad for Brockton, Mass.—Electric street car lines occupied the attention of the Malden board of aldermen last evening at its closing session. The East Middlesex Street Railroad Company was given permission to lay double tracks on Main street from Central square to the Melrose line, from Central square to Broadway on Salem street, and single tracks necessary for the double service on Ferry street to the Everett line. Permission to equip its plant for running cars by electricity was also given. The mayor was authorized to petition the legislature for permission to issue $100,000 in bonds for park purposes, the same to be voted upon by the city at large. In a short time every street car in Brockton will be run by electricity. This is one of the results of the recent consolidation of the two local lines of street railway, one of which has been operated by electricity since it was built, while the other had horses for motive power. The total number of miles of street railway to be equipped by electricity will be about 15, connecting Brockton with Whitman, Randolph and Avon. The two roads are under the management of H. B. Rogers, who for many years was superintendent of the Brockton Street Railway. The syndicate controlling the consolidated roads intends next Spring to extend the system to Holbrook, Easton and Stoughton.

Boston, Dec. 31, 1891. W. I. B.

OUR DAYTON LETTER.

The Dayton Fan and Motor Company are making preparations for a large trade during the coming year. They are now getting out a new and very handsome catalogue containing a number of novel designs for electroliers, with their fan attachment, which they claim will be the best ever put upon the market. They have just fitted up one of the finest establishments in Dayton with a line of these goods and the effect is very striking. The firm is comparatively a young one, only having been started three years ago, but they are essentially a wide-awake and enterprising concern, and have done wonders in that time.

Stillwell & Bierce, of Dayton, O., report a rushing business. They have just shipped a complete outfit of their goods, Victor turbine water wheels, friction clutches, etc., to the Nemasket Mills, of Taunton, Mass., one of the largest concerns in New England. They have also recently installed some very large plants through the South, where the manufacturing interests are developing rapidly. This firm is probably the largest and best known in their line in the country, and the excellent reputation they have established is bringing them a deservedly large share of the trade. They are now working on some new devices for their friction clutches which will soon be made public.

Dayton Electric Light Company.—The main station of the company for commercial incandescent lighting is situated on East Fourth street, in the center of the town, and covers a plot 50x100 feet. It is a brick building, two stories high, and from it they are now operating 4,500 lights. The Edison system is used, and the plant consists of six 1,000 light machines. These are driven by three engines of 150 horse-power each. One of these is a Buckeye and the other two are Beck engines. Steam is supplied by four boilers of 110 horse-power each, built by J. H. Brownell & Company, of Dayton. The engine can run at 240 revolutions under 80 pounds pressure. The company furnish light through the meter system, each consumer having his own meter and paying only for the amount of current used. This plan has been found to work very successfully, both for the company and its patrons, the latter not feeling obliged to burn their lights all night in order to "get square" with the company, and the tax on the plant being consequently lighter. Power is also furnished from this station to various parts of the city, and the company are now running 72 motors, developing in the aggregate about 150 horse-power. They will soon be called on to furnish power for two electric elevators which are being put in by the Hale Elevator Company, of Chicago. These will each have a lifting capacity of 2,000 pounds at the rate of 175 feet per minute, and will be operated from this station. The arc light plant for city lighting, the contract for which is also held by this company, is located on the opposite side of the Great Miami river, in what is known as Riverdale. The Thomson-Houston system is used here, and the present capacity of the plant is 300 lights. Water power is used here chiefly, being supplied from the river by means of the Stillwell & Bierce Company's turbines. The main shaft is fitted with clutch pulleys, also of their manufacture, so that either water power or steam can be used separately or together. There are two 100 horse-power boilers made by J. H. Brownell & Company, and one 150 horse-power slow speed Buckeye engine. The area of streets now lighted from the station is about seven square miles, but the steadily increasing demands for both city and commercial lighting will soon make it necessary to enlarge both plants considerably beyond their present capacity. H. G. T.

Dayton, O., December 26, 1891.

OUR CHICAGO LETTER.

The Tramway Locomotive which Charles T. Yerkes purchased in Paris last Summer for use on the North Division Street Railway line reached the Custom House yesterday. It will be tested within the next two weeks.

Cutter's Lamp Supporting Pulley is now made with a swivel clamp which allows it to be put up very quickly. Many plants which have been troubled by the falling of arc lamps are replacing their old pulleys with George Cutter's latest form.

An informal reception was tendered to the members of the press by the Chicago *Herald* Tuesday last and was largely attended by members of the fraternity from far and near. Music added to the enjoyment of the evening. Luncheon and punch were served, after which a visit throughout the building was made. Many were the compliments to the *Herald* which has one of the best equipped plants in the world.

Will buy Joliet's Street Railways—Another outside street railway property will soon pass into the hands of Chicago owners. John Norton of the Straw Board and the Western Stone Companies, is negotiating for the Joliet system of electric street railways and the electric light plant, all of which are one property. The price is $500,000. Chicagoans already own the street railway systems in Indianapolis, St Louis, Toledo, Los Angeles, Davenport and Rock Island.

An accident, resulting in the loss of two lives occurred Tuesday last at the World's Fair grounds. About 8 o'clock Andrew Johnson and John Allore, employed as carpenters on the electricity building, were engaged in hoisting timbers with a derrick on the second story. The supports to the derrick gave way and the machine crashed through the second story flooring, carrying the two men with it. In a few minutes the unfortunate men were reached. Both were dead.

Some quick work has recently been done in connection with the re-arrangement of Chicago Arc Light and Power Company's station recently destroyed by fire. On December 8, this company placed an order for a 200 horse-power Armington & Sims engine, The engine was shipped, complete, from St. Louis on the 9th inst. The railroad company delivered it in Chicago on the 14th, and on the 17th inst. the engine was ready for operation, and is now regularly pulling six 50-light arc dynamos.

Capitalists of Aurora and Batavia are the projectors of the latest electric railway scheme. The proposed road will connect the towns of Aurora, Batavia and Warrenville with Chicago. Work on the line will begin early in the Spring. The scheme, although still in embryo, is sure, the projectors say, to be carried out, as they have already interested a number of Chicago capitalists in the undertaking, and capital stock has already been sold to the amount of $750,000. H. H. Evans, of Aurora, is the father of the idea. He has been at work quietly for some time in the organization of the company. The articles of incorporation are ready to file in Springfield and will be forwarded this week. The name of the corporation will be "The Aurora and Chicago Inter-Urban Railway Company." The capital stock is $1,000,000. The incorporators are H. H. Evans, Aurora, president; William M. Van Nortwick, Batavia, vice-president; J. J. Luck, Aurora, secretary; W. J. Manning, of Chicago, John Meredith and J. W. Eddy, of Aurora, directors. M. J. B.

Chicago, January 2, 1892.

OUR ALBANY LETTER.

The Kinderhook and Hudson Railroad, running from Kinderhook to Hudson, N. Y., has been fully equipped with a telephone service. There is an instrument in every station along the route.

The electric light company at Ellenville, N. Y., started its incandescent system recently, and the majority of the stores employ it. The other places of business will use it as soon as the wires can be put in.

The Yonkers, N. Y., Railroad Company passed into the hands of a new syndicate January 1, of which Charles H. Montague is the head. Steps will soon be taken to change the motive power on most of the lines from horses to electricity.

At a recent meeting of the Lansingburg, N. Y., trustees, a communication was received from the police board suggesting that in view of recent burglaries, instead of increasing the police force, that the village streets be lighted by electricity. The trustees will consider the matter.

An electric light plant capable of running 350 incandescent lamps is being put in the Healy tanneries at Wellsville, N. Y. It will be used to light the two other tanneries also, which are running with night forces of men. The dynamo and engine are situated in a specially constructed building. In the vicinity of the tanneries the citizens will enjoy the brilliancy of arc lights.

It is suggested that dynamos be placed in Salem, N. Y., for the purpose of lighting the village with electricity. The steam mills located there have had a new 100 horse-power boiler put in and the electrical machinery could be run by this. The plan may come to a successful issue. The Hudson River Telephone Company have placed public telephones in a number of places in Amsterdam, N. Y. These telephones are supplied with small desks and are equipped with long distance instruments. The charge for their use is nominal, and they are proving of the greatest convenience to the public and considerable revenue to the company.

Albany, January 2, 1892. L. M. W.

OUR CLEVELAND LETTER.

The Short Electric Railway Company are, as usual, doing a rushing business, and their facilities are taxed to the utmost.

The Cleveland Electrical Supply Company, The Brightman Stoker Company, A. B. Lyman and others, all report business good.

A. G. Hathaway, the enterprising young contractor, has recently gone into the general machinists' supply business and is doing very well.

The Ford & Washburn Electric Company are in a happy frame of mind, and are preparing a surprise for the fraternity in the near future.

The Buckeye Electric Company are way in arrears of their orders, and have been obliged to build an entirely new and much more extensive plant, which is almost completed and will be ready for occupancy by January 1.

The outlook for the coming year in electrical circles in Cleveland is most encouraging. The general sentiment seems to be that business was never in better shape, and representative firms in the various lines of electrical industries report unusual activity.

The Hill Clutch Works have some large orders under way, and are more than satisfied with the outlook. They are doing the shafting work in the Brush Company's new buildings and have just completed a large order in fitting up the city electric light plant at Salina, O.

The Brush Electric Company have found it necessary to greatly enlarge their plant, and additions and alterations are rapidly being pushed forward which, when completed, will almost double their present capacity. Orders for the equipment of new plants throughout the country are pouring in rapidly. H. G. T.

Cleveland, O., December 23.

Address Wanted.

We are in receipt of a postal card upon which appears the following:

The ELECTRICAL REVIEW,
13 Park Row, New York.

Gentlemen: Please send catalogue of your books advertised in the REVIEW, and oblige,

R. G. VAUGHAN.

If Mr. Vaughan will send his address we shall be please to comply with his request.

OBITUARY.

Mr. C. A. Scott, manager and electrician of the New England department of the Union Switch and Signal Company, died Wednesday morning December 30, after a short illness arising from a severe attack of "la grippe." Mr. Scott had a large number of friends among the electrical industries and railroad companies of New England, and was respected and esteemed by all who knew him.

National Electric Light Association.

The following is a copy of a letter which Mr. Erastus Wiman proposes to send to central station men throughout the country:

DEAR SIR.—Having had the honor of being specially designated by Mr. C. R. Huntley, President of the National Electric Light Association, to address the next Convention at Buffalo, on the special subject of the financial side of electric lighting, I am desirous of all the help I can get to make a careful and strong presentation of the merits of this class of property. There is believed to be in the public mind, and especially in financial circles, a growing prejudice adverse to securities based on electrical properties. It would seem important at this juncture that as clear a view as possible should be had of the real facts of the case. Hence, it would be very desirable if I could be placed in possession of instances of successful companies, with particulars of the amounts of their stock, the length of time before dividends were paid, and the amounts regularly realized, cost of maintenance, and such other facts as can readily be got together. Some special instances of very successful concerns are particularly wished for, and the history of companies which have not at first been successful, but which have since been rescued from insolvency by good management, also any facts relating to combinations between gas and electric light companies, and how best it can be promoted.

If you happen to have anything of that kind and can send it for me to Mr. George F. Porter, 136 Liberty Street, N. Y., I shall be much indebted, and am,

Respectfully yours,

ERASTUS WIMAN.

We have no doubt that all central station officials who may receive this letter, will heartily and promptly respond to its contained request. Mr. Wiman's address will be upon a very important subject and it will be to the best interests of central station men if he is put in possession of all available facts.

PERSONAL.

Mr. Van Depoele, of the Thomson-Houston Company, has been ill.

Prof. Elihu Thomson has been suffering with a slight illness for a few days.

Dr. M. Wilhelm Meyer, editor of the German monthly *Himmel und Erde*, of Berlin, is visiting New York.

Mr. Charles Hayden, a prominent figure in financial circles in State street, Boston, recently favored the REVIEW with a brief visit.

Mr. Eugene F. Phillips, president of the American Electrical Works, Providence, last week greeted his many New York friends with that genial, catching smile of his.

Miss Anna Phyllis Ward, a niece of Julia Ward Howe, and Mr. Andrew Johnson, the St. Paul representative of the Electrical Supply Company, were married in St. Paul, Minn., on the 26th ult.

R. H. Pierce, formerly representative of the Edison General Electric Company in Wisconsin and Michigan and late with the Electrical Engineering Company, of Chicago, has been appointed assistant superintendent in the World's Fair electrical department.

Mr. Henry Hine, the bright and efficient general manager of the Stanley Electric Manufacturing Company, of Pittsfield, Mass., visited the metropolis during the holidays. Under Mr. Hine's able management his company has become one of the leading manufacturers in its special line.

Mr. E. C. Bradley, of Pittsburgh, until recently general manager of the Pennsylvania Railroad Company's telegraph service, on January 1 assumed the position of general manager of the Postal Telegraph Company. This position has heretofore been filled by Mr. A. B. Chandler, in addition to his duties as president, but the increasing business of the company compelled an addition to the working staff.

Telephonic News

*** The telephone company at Omaha, Neb., contemplate putting their wires underground.

*** The Mexican Telephone Company reports as follows:

	1891.	1890.	Inc.
Subscribers Dec. 12.... ...	1,214	1,098	116
Rental Nov. 12 to Dec. 12..	$6,122	$5,520	$602

*** The Heard County, Ga., Telephone Company is a recent organization, and a telephone line has been erected between Hogansville and Franklin, Ga.

*** George D. Sherman, formerly with the New England Telephone Company, at Augusta, Me., has taken a position as manager of the telephone exchange at Faribault, Minn.

*** The Southern New England Telephone Company is putting in a new metallic circuit in the Essex district which includes the towns on both sides of the Connecticut river, from Saybrook Point Corner to Godspeed's landing.

*** General Superintendent D. I. Carson, of New York, and Superintendent C. E. McCluer, of Richmond, of the Southern Bell Telephone Company, were in Roanoke, Va., on the 22d ult. looking after the company's interests there.

*** The Belgian government has notified the Bell Telephone Company, whose instruments are now used in Belgium, and which is at present doing all the telephone service, that on and after the first of January, 1892, the government will assume and conduct the service.

*** The output of the American Bell Telephone Company for the month ending December 20, 1891, was as follows:

	1891.	1890.	Inc.	Dec.
Gross output.. ..	5,095	5,542	....	447
Returned.....	3,522	3,171	351	....
Net	1,573	2,371	....	798

From Dec. 20, 1890 to Dec. 20, 1891:

	1890-91.	1889-90.	Inc.	Dec.
Gross	70,082	64,647	5,435	....
Returned.....	42,762	27,878	14,855	....
Net	27,320	36,769	....	9,449

*** The Valley Telephone Company, whose headquarters are at present at Middleton, N. S., is moving for an extension of its lines to Hantsport on the one hand and to Annapolis on the other, the line to connect at Hantsport with that of the Nova Scotia Telephone Company, and at Annapolis with the Maitland Telephone Company, running to Yarmouth. This extension would complete telephone connection between Halifax and Yarmouth.

The W. S. Hill Electric Company's "At Home."

The "at home" tendered by the W. S. Hill Electric Company, of Boston, in their New York office, Electrical Exchange, 136 Liberty street, Monday, the 4th, starts the new year with unusual interest. The fraternity in general were present and everybody seemed to have set apart a time to attend the festivities. Mr. Warren S. Hill and Mr. George H. Poor, general manager of the company, were present, and Mr. Ernest A. Des Marets, the New York manager of the concern, was master of ceremonies. A well attended collation was served. Mrs. E. A. Des Marets and Miss Annie Millbank graced the occasion for a short time in the morning.

The following are some of the friends who were present: Messrs. Warren S. Hill, George H. Poor, Boston; Ernest A. Des Marets, W. F. Adams, Vitilis Himmer, J. Holmes, P. H. Alexander, C. E. Chapin, A. G. Brown, Walter C. McIntire, C. H. W. Copeland, E. Wood, A. S. Vance, Albert G. Busley, Newton L. Schloss, E. T. Cobb, Chas. Dutton, Nathan Bushnell, H. Ward Leonard, New York.

The Lahmeyer Triphase System.

[From London *Electrician*.]

The firm of Lahmeyer, of Frankfort, has solved the problem of producing a safe compound motor in a very ingenious way. The danger of a reversal of polarity on suddenly increasing the load is avoided by using two magnetic fields acting on the same armature, the shunt and series coils being wound on different cores. The connections of the circuits are diagrammatically shown in Fig. 1. The shunt magnets *n n* are of much larger dimensions than the series magnets *d d*, and the field produced by them is the stronger even when the series magnets are highly saturated by an excessively heavy main current. The machine has been christened the "long-lead" motor, since the volts lost in the leads, which would have a very marked effect on the speed of a pure shunt motor, are here inoperative as a factor producing variable speed with varying load.

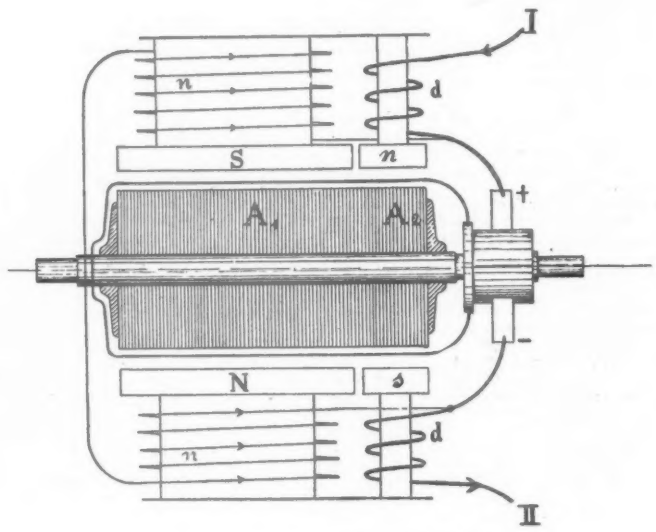

FIG. 1.—THE LAHMEYER "LONG-LEAD" MOTOR.

The Offenbach-Frankfort transmission of power, although not calculated to impress the public as much as that from Lauffen, was of interest to engineers. During the exhibition direct current alone was used, but soon after its close, Herr Lahmeyer was enabled to use the three-phase current.

First, as regards the direct current. At Offenbach, 6¼ miles by the wires from the Exhibition, there was a four-pole drum armature 50 kilowatt dynamo. The magnets were excited by a 110 volt current, and the excitation regulated by a resistance so that a constant voltage of 2,000 was always maintained at the terminals of the machine. The transmission wires were .24 inch in diameter, and the loss of pressure in the leads with the maximum current of 25 amperes was about 200 volts. The object of the transmission was to supply secondary current at Frankfort at a pressure of 110 volts. Two methods were alternately employed.

The first method involved the supply of current at a constant pressure of 2,000 volts *at* Frankfort, and to ensure this a small series-wound dynamo was circuited at Offenbach in series with the primary dynamo. The result of this was that, with maximum load on the line, there was an additional 200 volts at Offenbach giving about 2,000 at Frankfort, and of course with no current the magnets of the series wound dynamo were not excited, and there were, therefore, no additional volts. By this device, for all currents between 0 and 25 amperes, a constant pressure of 2,000 volts was supplied to the high pressure brushes of the "dynamotor" or continuous current transformer at Frankfort. The drum armature of this machine has, as usual, two windings and two commutators, for high and for low pressure. The machine is four-pole, and the initial excitation is given by a few high pressure series turns. These turns are wound under the shunt coils, taken off the low pressure magnet *coils* can be circuited in parallel with the low. It is only when the motor is to be stopped that there is a break in the high pressure circuit, and an ingenious switch is used, provided with a knife, which cuts through the spark at the instant of break.

It was to be feared, of course, that as the high and low pressure wires lie one under the other on the armature, in case of a fault in the insulation the 2,000 volt current would find its way into the low pressure wires, and so prove a danger to the users of the current. In addition to relays intended to break all contacts in such a case, Herr Lahmeyer has devised the following simple way of averting this danger. Between the high and low pressure windings there is a metallic screen, usually of copper gauze, which is divided into two parts by insulation to avoid Foucault currents, each part being joined to earth. If any high pressure rupture occurs, the current would not pass through the metallic screen, but would go to earth. This safeguard is used by Herr Lahmeyer in his high pressure machines whenever possible. In the dynamotor just described, it was found possible to keep the secondary pressure constant to within 4 per cent.

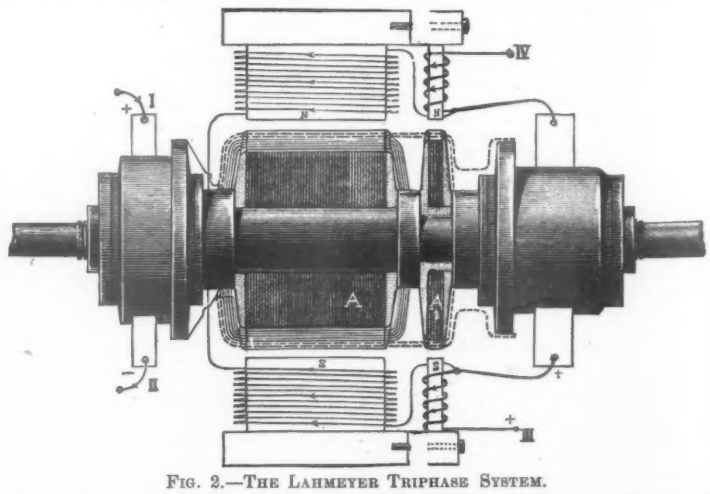

FIG. 2.—THE LAHMEYER TRIPHASE SYSTEM.

In the other continuous current plant, the auxiliary dynamo employed to compensate the loss of volts in the leads was dispensed with, and the pressure at Frankfort varied from 2,000 to 1,800 volts, according to the load. The transformer used in this system has two magnetic fields, as shown in the diagram (Fig. 2). The high pressure current supplied through brushes I and II is taken round the armature A_1 alone (with the exception of a few additional turns for initial excitation as before); the low pressure coils surround the armature core A_1 in addition to the second armature core A_2. The field magnet coils are arranged as shown in the figure, the low pressure terminals being III and IV. From the diagram it will be seen that the following conditions necessary for a constant secondary pressure under a varying load can be fulfilled by this system if the dimensions are properly chosen. With an increasing load the motor armature requires a small decrease in its magnetic field to keep the speed constant. The dynamo armature, on the contrary, requires a corresponding increase of field strength in order to compensate the increased loss of volts in the armature. Owing, no doubt, to the constancy of the resultant field, sparking was entirely absent from the secondary commutator at change of load, and once adjusted the dynamotor required no attention. Both these machines have fulfilled the high expectations formed of them before the Exhibition.

As regards the three-phase current transmission, it was so simple and successful that a few words will suffice to describe it. In Offenbach there was a four-pole drum armature dynamo excited by a 110 volt current. By means of rings and brushes three currents of 120 deg. phase difference were taken from the armature and led by three wires to the three brushes of a corresponding machine at Frankfort. This machine (Fig. 3) needs a little description. It is, in fact, the continuous current transformer or dynamotor first described, which was supplied with a constant pressure of 2,000 volts. The high pressure commutator was taken off, and three rings fitted on in its place, the two armature windings remaining just as before, the high pressure coils used on the field magnets for initial excitation being unused. (See diagram, Fig. 4.) The rings are connected with points on the armature 120 degrees apart, and the current being supplied by brushes in the usual way, the dynamotor starts (without load), no initial excitation being needed, and as soon as synchronism is shown by the voltmeter to have been reached, the shunt windings from the low pressure brushes are switched in and finally the lights. Between any two of the 6¼ mile conductors the mean potential difference was about 1,300 volts; but in consequence of the synchronism the pressure variations which occur from variable losses in the leads with varying loads have no effect on the constancy of the secondary 110 volts. The smooth, noiseless running of this transformer of three-phase to continuous current was particularly striking. It required absolutely no attention during long runs with different loads, and there was no sparking whatever.

A Full Deck.

The American Electrical Works, of Providence, leads, as usual, with a strong hand, the whole pack in fact, and we find on our desk for '92, a very handsome deck of playing cards, bearing the well-known legends of that wide-awake firm. We are sure that with such a deal our friends will be able to sweep the board for '92.

Electric Stocks as Investments.

Electric companies have an immense, practically new field before them and there is no reason why the securities of thoroughly well managed concerns should not be favorably regarded by investors. Large amounts of moneys are necessary to carry on a general electrical business as is natural in a growing industry of its magnitude. That the three or four largest companies will eventually consolidate is considered very probable, indeed, it is said that the men in Boston and New York who are backing both the Thomson-Houston and the Westinghouse desire a union of these two interests at least. It would certainly make a strong concern and reduce competition very materially. But these gentlemen are understood to desire it mainly from a financial standpoint.—*Boston Commercial Advertiser.*

A Uniform Would Have Spoiled this Joke.

[From the Chicago *Mail.*]

He apparently was a visitor from the rural districts who was totally unacquainted with city ways. He entered one of the offices at the city building and finally attracted the attention of a clerk, who rather gruffly inquired: "Well, what is it? What can I do for you?"

"Where's your telephone?" asked the caller, taking a survey of the room.

"Over there."

Without saying another word the caller walked across the room, timidly took down the receiver, placed it to his ear, and stood for a minute as still as a statue, evidently listening and waiting for the mysterious instrument to "say something" to him. Then he carefully hung up the receiver, glanced around the room, and noticed that the face of every clerk was stretched out of its normal shape by a smile of generous proportions. Again he returned to the attack. After listening as before he tapped on the transmitter several times. Again he waited. Then he glanced about him, put his lips close to the 'phone, and said quietly—very quietly, "Hello!"

This was too much for the amused clerks to stand, and after a hearty chorus of laughter one of them kindly volunteered to show the old man how to operate the new-fangled talking machine.

"Hang up that receiver just as it was when you found it. Turn that little crank at the right, which rings the bell. Then take down the 'phone, place it to your ear, and when the central girl answers tell her ——."

The old gentleman slowly turned, and gazing long and steadfastly on his young friend, remarked in that same sad, sweet voice,

"Say! Don't get gay, now. I'm the inspector, and I'm just testing your telephone."

The Tropical American Telephone Company.

It has long been apparent that the best interests of this company required its head office to be in New York city. The bulk of the company's trade is with the New York exporters, the bulk of its shipments are made from New York and the foreign correspondence can as well go to New York direct as to Boston, as formerly.

Hereafter the executive and business offices of the company will be at 95 Broad street, corner Pearl, New York city, where a suite of rooms has been engaged and taken possession of. The offices are in the immediate vicinity of the Custom House and a large number of exporting houses who deal with this company. All business will hereafter be conducted from these headquarters.

Chas. Williams, Jr., has resigned as president and director, owing to his continued absence in Europe, now over 20 months. He has no intention of returning during 1892.

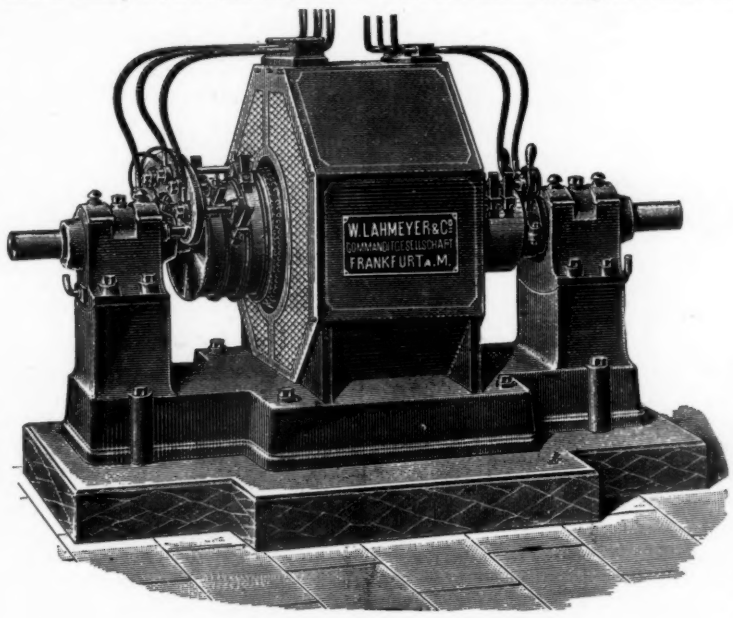

FIG. 3.—THE LAHMEYER TRIPHASE SYSTEM.

A Trolley Road From Jersey City to Newark, N. J.

Work was started this week on the electric railroad which the Pennsylvania Railroad Company has projected between Jersey City and Newark. It will join the Market street and Irvington line in Newark to the Jersey City and Bergen Electric Road, and will pass through four and one-half miles of open country upon which there is hardly a house and no solid ground to build upon.

It is understood that the road will be used to demonstrate the advantages of electric trolley propulsion over locomotives, and that the maximum of speed will be attained in crossing the meadows. The distance from the ferry to Irvington is 12 miles, five miles of which is through crowded parts of Newark and Jersey City, and the rest is territory in which high speed will be admissible. The Pennsylvania Railroad Company owns the Jersey City and Bergen Railroad.

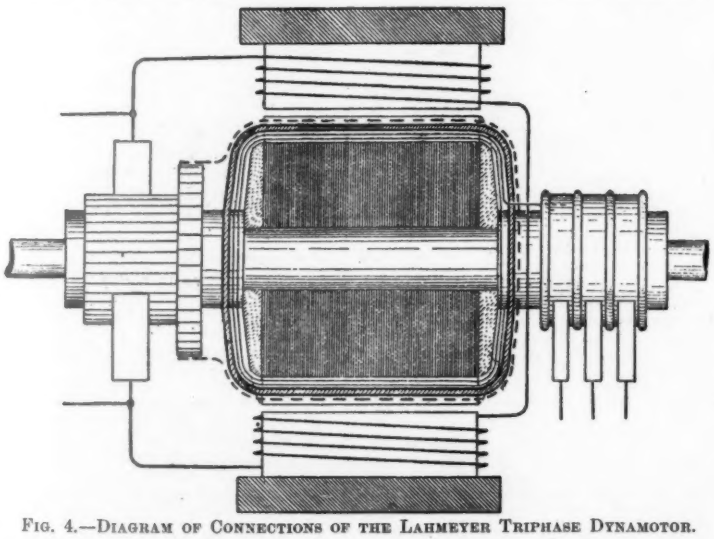

FIG. 4.—DIAGRAM OF CONNECTIONS OF THE LAHMEYER TRIPHASE DYNAMOTOR.

Some Successful Mechanics.

In this country there is practically no end to the number of men who found a trade the most valuable of all helps on the road to fame and fortune, writes Foster Coates in his boys' department in the January *Ladies' Home Journal.* There is Thomas A. Edison, the greatest genius of our day. Learning telegraphy was the first thing that led him into that intimacy with electricity which has ended with him being its master; Andrew Carnegie was a telegrapher; Charles Pratt, whom I have mentioned above, and who did more to help young men to acquire trades than any man whom I can mention, started in life as a machinist; Judge Daniels, of the Supreme Court of the State of New York, was a shoemaker; William R. Grace, who was Mayor of New York, and who is worth some twenty million dollars, was a butcher; the late George Jones, who, as editor of the New York *Times*, was one of the most powerful men of his day, was a printer's "devil," in the same office with Horace Greeley when both were boys; Jay Gould, the great financier, was first a tanner and then a surveyor; Dr. John R. Paxton, D. D., who preaches to the wealthiest congregation in the world, began life as a carpenter; Philip Armour, the Chicago millionaire, was a moulder; the late John Kelly, the famous politician, was a grate seller; John D. Rockefeller, now worth one hundred and twenty-five million dollars, was a mechanic in iron; Rev. Robert Collyer, D. D., was a blacksmith; John A. Mackay was a stone mason before he became the owner of the Comstock Lode, and one of the richest men in the world; Jesse Seligman, the eminent banker and philanthropist, laid the foundation of his fortune by studying in the very poor night trade schools that existed when he was young; United States Senator Hill, of New York, was a printer; the late Henry W. Grady, the greatest orator the South has given us since the days of Calhoun, was also a printer. And so it goes. I could give scores of other names of men who were mechanics, or were skilled in trades and became great after serving faithfully at their various tasks.

Judge Dykman, of White Plains, N. Y., has granted a preliminary injunction restraining the board of trustees of Williamsbridge from granting a franchise to the East Chester Electric Company to light the streets of that village. On December 31 the terms of President Duncan and Trustee Mulligan expire, and they will be succeeded by the members elected in September last, in opposition to the present board. After the September election, it is alleged, the board granted to the East Chester Electric Company a franchise to run a railroad on the main street of the village, and afterward entertained an application from the same company to light the streets for five years. It is now contended that as the contract with the New York and New Jersey Company does not expire during the existence of the present board, the board as now constituted cannot anticipate the action of succeeding boards.

TELEGRAPHIC

.... The Oldtown, Me., citizens are bent on having an electric fire alarm system.

.... After occupying one building for 40 years, the Western Union Telegraph Company has changed its Rochester, N. Y., headquarters.

.... During the past week business over the Western Union lines from Boston to the West and South was somewhat delayed. A wind storm in the vicinity of Meriden, Conn., blew down the wires, causing the delay.

.... Harrison Strickler, the oldest telegraph operator in the employ of the Pennsylvania Railroad Company, died at Lancaster on December 28 in his sixty-seventh year. He had been with the company 35 years.

.... It is reported that a car containing 10 non-union operators whom the Western Union Telegraph Company was sending South to take the place of strikers was broken into at Texarkana, Ark., January 2, and three of the men were killed.

.... The strike of the Order of Railway Telegraphers of the Southern Pacific is still on with no decided advantage on either side to date. The telegraphers have been granted their demand by the Atlantic and Pacific Railroad, a branch of the Santa Fé system.

.... The Eureka, Cal., Chamber of Commerce has heard a petition asking the government to establish a telegraph line to connect the Seal Rock Lighthouse, Life Saving Station on Humboldt Bay and Mendocino Light. The petition was ordered forwarded under the seal of the Chamber.

A New Thomson-Houston Factory.

President Coffin is still in Chicago and his return is expected the last of the week. The recent report that the company has decided on the location of a new factory was premature, because Mr. Coffin's Chicago trip is on this very business. It may be stated unofficially that the additional factory facilities needed will probably be located at Chicago. —*Boston News Bureau.*

Brush Electric Company.

The Brush Electric Company issued $500,000 30 year six per cent. gold bonds May 1, 1891, secured by a first mortgage on the land, buildings, machinery and fixtures in Cleveland, Ohio. The Old Colony Trust Company is trustee for the bondholders. The bonds may be called at 103 in five years, and a sinking fund is provided with which the company must redeem 10 bonds per annum, to be drawn by lot beginning May 1, 1896. A very few only of the bonds have been sold, and no effort has been made to sell them, because the company had no immediate need of the money and the market has not been considered favorable.—*Boston News Bureau.*

The Lowest Bidder.

A bill in equity was filed in Philadelphia last week by the Philadelphia Illuminating Company against Director Windrim, to restrain him from awarding certain electric lighting contracts for the year 1892, claiming that they had not been given to the lowest bidders.

Two weeks ago the Brush Company was awarded the contracts on a bid of 40 cents a light per night for the district between Callowhill and South streets and the two rivers, and the offer to donate the 31 lights on Chestnut street was a free gift to the city.

The Philadelphia Illuminating Company's bid was on the 85 arc lights between Vine and South streets and Broad and Eighth streets, which they offered to furnish at 35 cents a light per night.

* * The Brooklyn, Bushwick and Queens County (horse) Railroad will be reorganized and fitted with the trolley system.

* * The electric railway connecting Wellsville and East Liverpool, O., was opened for traffic December 17. The Short system is used.

* * The Fidelity Title and Deposit Company has been appointed receiver of the Eckert Electric Manufacturing Company, of Newark, N. J.

* * The matter of an electric railway from Sherborn to Natick, Mass., is still under consideration. The scheme has many supporters in both towns.

* * The Jersey City Board of Street and Water Commissioners passed an ordinance yesterday allowing the Jersey City and Bergen Railroad to construct electric transit lines in Jersey City.

* * The subject of an electric street railway between Olneyville and Providence, R. I., is being very thoroughly agitated by the Business Men's Association, of which Geo. F. Beane is president.

* * It is possible that Lewiston, Me., may have a new industry within the city limits soon. The Patton Motor Manufacturing Company, of Chicago, are communicating with Col. J. T. Small relative to the matter.

* * The New York Board of Railway Commissioners will give a hearing in the common council chamber in Brooklyn on January 6, at 11 A. M., on the applications of the Brooklyn City and Newtown and Coney Island and Brooklyn Railroad Companies for permission to change the motive power of those roads from horses to electricity.

* * Already California capitalists are discussing the feasibility of obtaining power by electrical transmission from the streams along the foot hills of the Sierra Nevada and the Sierra Madre, not only to drive their factories, but also to operate their railways. In Sacramento, in Stockton, in the growing towns of the San Joaquin, Sacramento and San Bernardino valleys, the question is being vigorously agitated.

The Thomson-Houston Combined Snow Sweeper.

The Thomson-Houston Electric Company has recently placed before the electric railway fraternity, as the result of a careful and thorough investigation of the subject of removing snow and ice from the street railway tracks, the machine described in this article, viz., the combined snow sweeper.

This investigation, which has been going on ever since the Thomson-Houston Company first engaged in the railway business, has been pushed with extreme vigor during the past 12 months by a committee of practical men appointed by the company for the purpose. This committee was instructed to produce, if possible, a machine of such perfection that the subject need be given no further attention for the next three or four years.

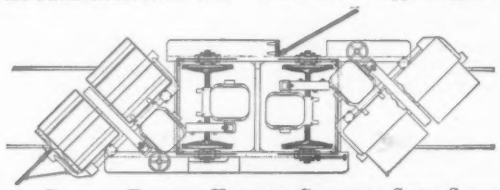

FIG. 4.—PLAN OF THOMSON-HOUSTON COMBINED SNOW SWEEPER.

FIG. 1.—THOMSON-HOUSTON COMBINED SNOW SWEEPER.

The committee made a careful study of all known devices for removing snow and ice from steam and street railroads; also, of the machines designed for cleaning city streets. Among the most important of this class are the various types of shear and wedge plows, from the track scrapers, as applied to street cars, to the ponderous wedge plow propelled by ten or a dozen locomotives, used on the Union Pacific Railroad, and the almost unlimited number of devices employing brushes in various forms, from the small stationary and revolving track brushes attached to each car, through the various grades of sweepers for both street and street railway purposes for which horse power is used, up to the large, self-contained electric snow sweepers. Schemes were considered for attaching to each car large and small plows, scrapers and brushes, either stationary or revolving, for the operation of which power was to be furnished either by the car motors or separate motors. Also, many suggestions were considered for picking up the snow bodily, conveying it over the machine and dumping it into cars at the side.

The machine consists of a 50 pound section steel I beam frame, bolted together with cast-steel connecting angles and supported on springs in such a manner that it hangs below the axle (the axle-box being self-oiling, dust proof and with standard brass bearings), mounted on 36 inch 400 pound wheels.

The ends of this frame are built at an angle of 45 degrees, and on each of the angle beams are bolted two steel bearing stands, in the babbitted bearings of which rests a three and three-eighths inch steel rocker shaft. On one side of the rocker shaft are keyed three steel arms for supporting the flyer, while on the other side is keyed a cast-iron cradle in which the motor driving the flyer rests. From this construction it will be seen that the weight of the motor acts as a counterbalance to the weight of the flyer around the rocker shaft as a center, and that the relative positions of the motors and the flyer are always the same, thus permitting the use of spur gears (by far the most efficient and economical arrangement) for transmitting power from the motors to the flyers.

The flyer itself is one of the most important and perhaps the most novel feature of the machine. It can be likened to the paddle of a stern-wheel steamboat, set at an angle of 45 degrees with the boat, instead of square across, the paddle being driven to propel the boat while the boat is being continually drawn backward by a swift current which is stronger than the propelling power of the paddle. In the sweeper, the paddle is represented by the flyer on that end of the machine which is advancing (the other flyer being raised from the ground and not in use), and the swift current by the motors on the axles.

The flyer is constructed in the following manner: Four steel spider castings, each with eight radial arms, are keyed to the two and three-quarters inch flyer shaft. To these radial arms are bolted other steel castings of such shape that the whole form two pairs of wheels 44 inches in diameter on one axle. The wheels of each pair are 41 inches apart, with a space of nine inches along the shaft between each pair. This space is left for the spur gear which drives the flyer. Between the spokes of each pair of wheels are bolted the quarter-inch thick steel boiler plate blades constituting the paddles. The diameter of the paddles is two inches less than the diameter of the wheels. To the back side of these paddles are bolted brushes made of flat, spring-tempered, steel wire, set edgewise in well-seasoned rock maple three and one-half inches square, so that the wire projects one inch beyond the paddles, or on the same line as the circumference of the wheels. The steel wire in these brushes is of very high quality and of such temper that it can be bent back square upon itself and straightened out again without breaking. The wood is treated with paraffine before the wire is strung in, and after stringing the whole is soaked in boiling asphaltum, rendering the wood thoroughly impervious to water, filling up the holes and coating the wires at the base, thus effectually protecting them from rust.

The gear on the flyer shaft is of steel, with a removable and reversible rim having machine-cut teeth. The flyer is raised and lowered around the rocker shaft as a center by a screw attached to the cradle-casting before mentioned. This screw is worked by a ratchet hand lever, the total vertical adjustment being about six inches.

A powerful toggle joint brake is used, worked by a hand lever. Its construction is such that when the hand lever is thrown back into its normal position the brake is released in a positive manner without the use of springs.

In front of each pair of wheels is a drag ice-digger, which is constructed as follows: A cast-iron shoe, which is grooved to fit the rail, is suspended in front of each wheel. These shoes are connected by a cross bar. A spring between this bar and the body of the arc gives the required pressure. The diggers can be raised or lowered by a lever. (In Fig. 1, the top of this lever can be seen in front of the left-hand window, being raised and held in that position by a chain. In Fig. 2 the diggers on the left are lowered, while on the right they are raised.) These diggers are used to remove from the rail any snow or ice left by the flyer, leaving an absolutely clean rail, and consequently perfect contact for the wheels—a result hitherto attained by no machine.

Should the operator neglect to raise the diggers on running into a switch, the cast-

DIMENSIONS OF THOMSON-HOUSTON COMBINED SNOW SWEEPER.

	Narrow.	Standard.	Wide.
Wheel base	6 ft.	6 ft.	6 ft.
Height from rail to top of trolley board	10 ft.	10 ft.	10 ft.
Extreme length	26 ft. 2 in.	26 ft. 8 in.	27 ft. 2 in.
Extreme width	7 ft. 10¼ in.	8 ft. 4¼ in.	8 ft. 10¼ in.
Width of frame between centers of I beams	5 ft. ¼ in.	5 ft. 8¾ in.	6 ft. 4½ in.
Adapted for roads having gauges	3 ft. to 4 ft.	4 ft. to 4 ft. 10 in.	4 ft. 10 in. to 5 ft. 6 in.

iron shoe alone will be broken, without injuring the rest of the machine in the slightest degree, this shoe, of course, being easily and cheaply replaced.

The cab protects the wires and electrical apparatus, and forms a support for the trolley stand and pole. As it is built of unusual strength, it provides a ready means of handling the motors in the following manner while mounting or unmounting them: Two steel I beams which run diagonally across the cab are hung from the roof, and on these beams runs a small traveling trolley. A Weston block can be hooked into this trolley, the motor raised and run toward the doors, then lowered on to planks and rolled out.

Shears, or wing scrapers, although not shown in the illustration, are provided, extending on one side for the purpose of gathering the snow from between the tracks into the flyer so that it may be thrown off, and on the other side to level the snow which accumulates beside the track, in order that it may not fall or be pushed back on the rail.

The electrical equipment consists of four railway motors, preferably of a waterproof type. Two of these motors are of standard speed, and are connected to the axles in the usual manner. The other two differ from the axle motors only in the fact that their armatures and fields are wound for 1,200 revolutions of armature per minute normal speed under load, instead of 620 revolutions, the speed of the axle motors. These two motors are for driving the flyers, and are mounted as follows: A short axle with a standard axle gear is placed on the axle bearings of the motor. The motor is then bolted to the cradle-casting in such manner that the axle gear meshes with the flyer gear and acts solely as an intermediate for transmitting the power from the armature to the flyer. This will be clearly seen by careful inspection of Fig. 2.

All gears are cased and can be run in oil or light grease. To do thorough work in a severe climate with a heavy snow fall, all the motors should be of 25 horse-power. Where climatic conditions are not severe or where the snow fall is not excessive, motors of less power will do the work. The motor best adapted to the machine is the Thomson-Houston narrow gauge waterproof type, in which the lower half is a bowl-shaped casting, with no openings below the center of the armature, which is on a line with the center of the axle. The flooring of the cab can be made to fit close to this casting on all sides, so that the motors are absolutely protected from snow and slush. On account of the location of the gears, this style of motor *must* be used for driving the flyers; but any type of motor that will go on a car of the same gauge may be used on the axle. A more detailed description of this motor will be given in a pamphlet which is soon to be issued.

The rheostats are fastened to the sides of the cab and are operated by hand wheels on the outside. Four rheostats, one for each of the flyer motors and two for the axle motors, are used. Only two rheostats are in use at the same time, thus allowing the remaining two to cool.

The wiring for the axle motors is such that, by the use of controlling switches placed conveniently for running in either direction, the motors may be run in multiple, as in ordinary car practice, giving the regular car speed; or in series, giving half the speed but twice the torque, thus giving enormous power for propelling the machine on steep grades, or through heavy snow and ice. All wiring and, in fact, all the electrical apparatus, excepting the motors and rheostats, is on the under side of the roof, where it is thoroughly protected from the weather.

Two five-lamp light circuits are used, each circuit consisting of a head-light on the hood, one lamp outside the cab under the hood and three lamps inside the cab. A portable wire-guarded lamp, with attaching plug and 25 feet of flexible cable, is also provided.

The machine is provided with sand-boxes, so that sand may be used in front of each wheel.

To accommodate the many different gauges throughout the country, it was found necessary to build three different sizes of machine, distinguished as the narrow gauge, the standard gauge and the wide gauge.

The only change necessary for adapting each frame to any gauge within its limits is to move the wheels on the axles.

For wide and standard gauge roads where the distance between centers of double tracks is not sufficient to permit the use of the flyer designed for these gauges, the smaller sized flyer may be used, the only disadvantage being that the smaller sized flyer will not clear so far outside of each rail. For example, a road of 5 feet, 2½ inch gauge has only 8 feet, 6 inches between centers of double track; so the wide gauge frames must be used. The flyer designed for this frame has an extreme dimension of 8 feet 10¼ inches, whereas 8 feet 6 inches is the total available space; therefore, the flyer designed for the standard gauge frame is used, giving an extreme dimension of 8 feet 4¼ inches, thus allowing about 3½ inches clearance.

For roads where cars are always run with the same end foremost, one flyer and its

(Continued on page 276.)

FIG. 2.—THOMSON-HOUSTON COMBINED SNOW SWEEPER.

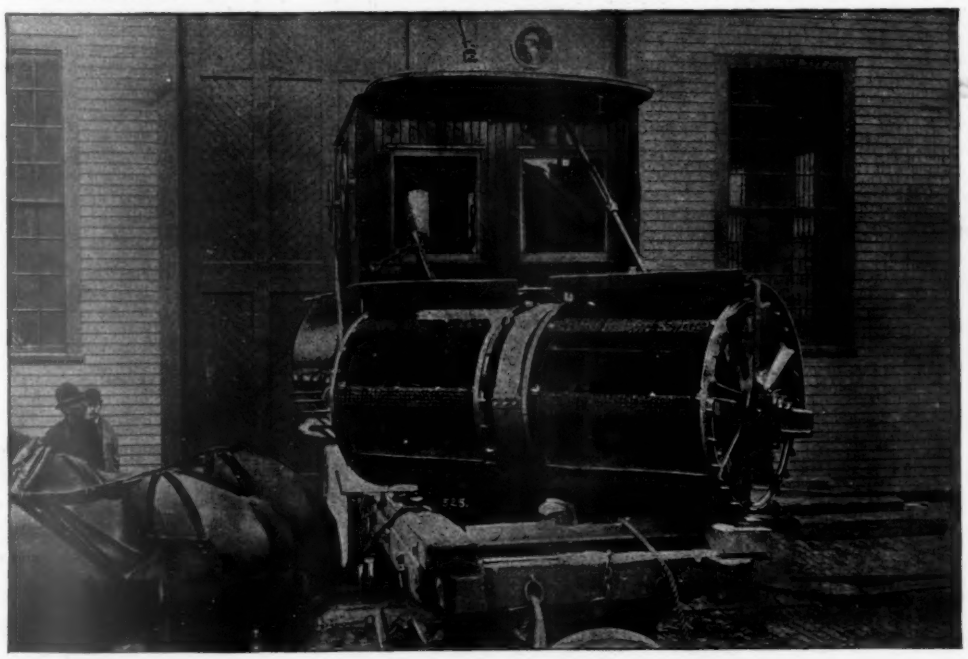

FIG. 3.—THOMSON-HOUSTON COMBINED SNOW SWEEPER.

ELECTRIC LIGHT NEWS

—— Terre Haute, Ind., is debating the subject of doing its own electric lighting.

—— The town council of Springport, O., has ordered a special election for January 4 for the purpose of voting for electric lights.

—— The Houlton, Me., Electric Light Company have recently purchased a new incandescent light dynamo of 650 lights capacity.

—— The Allentown, Pa., Electric Light and Power Company has ordered a 60 light arc dynamo from the Fort Wayne Jenney Electric Company.

—— The subject of electric lighting is occupying much of the attention of the good citizens of Athol, Mass. There is talk of installing several private plants.

—— The city of Harriman, Tenn., with a population of 4,000, is considering the advisability of establishing its own electric light and water works plant. Inquiries should be addressed to W. H. Parsons, city clerk.

—— It is rumored that the Thomson-Houston Company has decided on a new factory which will be on the line of a trunk railroad and have deep water. It is also reported that some property in East Boston is favorably considered.

—— The Wakefield citizens will probably apply to the Massachusetts legislature for authority to establish an electric light plant. The Wakefield Company offer their gas and electric plant at $140,000. The town does not want to buy the gas business.

—— The Lawrence Gas & Electric Light Company, New Castle, Pa., have been increasing their capacity by the addition of a 150 horse-power Ball engine, built by the Ball Engine Company, Erie, Pa. Dravo & Black, the Pittsburgh agents of the Ball Engine Company, did the installation.

—— Suits to enjoin the infringement of patents for arc electric lights have been begun in the United States Circuit Court, at Chicago, by the Brush Electric Company, of Cleveland, against Marshall, Field & Company, the Chicago Arc Light & Power Company, Willoughby, Hill & Company, and Carson, Pirie, Scott & Company. It is alleged that the defendants are using electric lamps, made by other companies, which infringe on the patents of the Brush Company.

—— Director Herrick submitted to the board of electrical control, of Cleveland, O., a report that it would cost the city for an electric light plant of 2,000 arc lights with 475 miles of streets, a total of $464,000, using wooden poles, and with iron pipe poles $725,000. This report was made in pursuance of a resolution of the council asking for estimates of the cost of gas and electric plants. All the necessary steps for an electric light plant to be owned by the city have been taken. The legislature must now issue bonds.

—— The successful bidders for street lighting in Philadelphia for next year in a number of districts will be compelled to put up new lines to reach the lamps which have been established, and at least 1,000 new poles will have to be erected. The electrical bureau is powerless to compel the existing poles to be taken down, so Chief Walker, in order to accomplish the removal of old poles, has prescribed in the permits granted this year that the new poles shall be placed where the old ones now stand. There is some question, however, as to whether this will accomplish the desired result. Chief Walker has recommended that in future all poles be erected by the city and leased to the contracting companies. This plan has been urged upon the council but has not yet been adopted.

THE THOMSON-HOUSTON COMBINED SNOW SWEEPER.

(*Continued from page 275.*)

parts may be omitted from the machine. The total weight of the sweeper is about 25,000 pounds, or nearly the same as a 16-foot car with 80 or 90 people on board. This weight is supported on springs and is absolutely essential to the efficient working of the machine in heavy snow and ice.

Throughout the machine all the castings subjected to shock or strain are of steel, and all work is done to template.

Especial attention is called to the facts that the electrical equipment of each machine includes two car equipments and that the construction is such that the motors may be very readily changed over to the cars. Thus the extra equipment generally found necessary for the Summer service may be utilized on the snow sweepers in Winter, instead of lying idle.

Three men, motor-man, flyer-man and trolley-man, are required to operate the machine, although more are desirabie.

In Fig. 1: Suppose the machine to be advancing towards the observer. The motor-man stands on the running board on the left side of the machine just in front of the cab, with his left hand upon the rheostat hand-wheel, shown in the center of the sign "combined snow sweeper," his right hand upon the vertical brake lever immediately under the sign. The two handles shown in front of the upper part of the window are the reversing switch handles for the multiple or series combinations, and the lever extending across the front of the cab, the top of which, held by a chain, appears in front of the lower part of the window, is the ice-digger lifting device.

The flyer-man stands on the running board in front of the cab on the opposite side from the motor-man. His right hand on the rheostat hand wheel and his left hand on the ratchet lifting lever seen just over the flyer gear case. As the flyer always revolves in the same direction, he does not need any reversing switch. The trolley-man stands on the same running board as the motor-man, but at the rear of the machine. All the controlling devices are within easy and convenient reach. The flyer and ice-digger at the rear of the machine are raised as high as possible and are not in use. The flyer in the front of the machine can be either lowered to the ground or held suspended at any height within the limit of its adjustment. The ice-digger in front is held down on the rail by its lever.

In light snows the flyer is revolved at its normal speed and the truck is driven on the multiple connection at full car speed, leaving a perfectly clean road-bed and rail; or leaving a clean rail but with several inches of snow on the road-bed for the easy hauling of sleighs. Where deep and heavy snow, ice or steep grades are met, the truck is propelled with increased power but less speed on the series connection, the speed of the flyers, however, remaining constant. As the flyer has eight blades and makes 150 revolutions per minute, there are eight times 150 or 1,250 blows struck each minute; and as these 1,200 blows can be struck within a linear distance of ten feet, it can readily be understood what tremendous execution the machine is capable of, especially when it is remembered that the quarter-inch thick steel plate takes the brunt of the work, the brushes simply serving to clear the snow close to the ground, which the plate could not well do because of the unevenness generally found in street railroads.

The name "Combined Snow Sweeper" is derived from the fact that the machine accomplishes the work of both the plow and sweeper in use at the present time, and does the work more economically and efficiently; in fact, it will accomplish what it has been impossible to do heretofore, except by a gang of men with picks and shovels.

More Calendars.

Ziegler Brothers, electrical engineers, 73 Federal street, Boston, this year make use of a very large calendar upon which appear illustrations of a number of special instruments.

The Commercial Cable Company favors us with a lozenge shaped calendar on which is printed a map showing the company's lines. Much useful information is contained in the calendar fad.

Alfred F. Moore, 200 to 202 North Third street, Philadelphia, the well-known wire manufacturer, sends out a calendar beside which all others up to date are but pigmies. The figures are immense.

The Ashton Valve Company, 271 Franklin street, Boston, have sent us one of Lowell's beautifully engraved calendars. The subject is "The Dawn of the New Year." It is very handsome.

The Direct United States Cable Company, Limited, have sent us a handsome daily pad calendar surmounted by a winged-foot Mercury perched on a globe. On each sheet of the calendar pad is printed, "Mark your cablegrams 'Via Direct Cable.'"

ELECTRICAL EXHIBITS AT THE COLUMBIAN EXPOSITION.

(*Continued from page 269.*)

to bring into friendly but brisk business competition the companies and systems of this country and Europe. The questions of the saving of energy by the perfection of machinery and insulation will be closely calculated, and the various systems will be thoroughly tested by the efficient juries on awards, of which more hereafter. Artistic lighting of theatres, hotels, residences and streets will be given an impetus, placed as these features will be in competition with art in every other conceivable dress. The brisk, practical business methods of the electrical people of this country have left little time to art and æstheticism up to the present time, while the people of Europe have, on the contrary, led art and electricity hand and hand. The Columbian Exposition may have some surprises in store for visitors in this behalf, and will undoubtedly be a source of much pleasure and instruction.

The transmission of power from sources at points along available water-courses, or in the immediate vicinity of fuel for steam, and remote from the desired point of application, has been given much attention of late and much newspaper comment has been made upon alleged successful inventions. This has seemed to me surprising, coming from electrical journals, at least, since all of us in this country ought to be aware of the fact that long distance transmission has long been an accepted application of electricity in the mines of the West and Southwest, and has done much toward revolutionizing the processes of mining. At many points in the West far removed from fuel for steam, and at long distances from water power, mines are being successfully operated that could not have been so where fuel was to be delivered at the mine, instead of the developed power ready for application. Some new things have come into practice in this field of electrical work, in Europe, of late, and at the Columbian Exposition we will see an increased interest in this work of transmission, and there is in contemplation a project to make a most instructive object lesson by placing in practical operation a water-wheel motor with wiring and terminals for application at an artificial mine some distance away. The many applications of the electrical current, of various quantities and qualities, in mining and milling work, will come under this head, and I am assured of some new and valuable contributions in the way of machinery.

In the whole field of electrical invention, moreover, there are promised models of invention setting out new principles, and numberless contrivances will be a part of the exhibit to testify to the large measure of usefulness of electricity in the various directions of its application. It is hoped, also, that the exhibits accepted will be object lessons to the general public, which will inculcate a clear judgment to appreciate the fact that there are legitimate uses of electricity and that, on the other hand, there are applications of the current which closely border upon the fraudulent, and which are mere catch-pennies and brought forward wholly because of the mystery and hocus pocus that surround them. I feel it a part of the duty of the Department of Electricity to unreservedly oppose the presence of these things and by discountenancing them, have an effect in a degree to rob them of their harmful influence. People must come to understand that electricity is not a mysterious force, uncertain in its operation and liable to all sorts of eccentric deviation from the desired course. Until this understanding has been arrived at with the public, the electrical people will suffer more or less from frauds practiced by the unscrupulous, and will with obstructions in the shape of legal injunctions to prevent the laying of electric roads and lines of wire for transmission, and the actual dangers of electricity will be magnified many fold by those interested in restricting its use.

The remaining feature of the electrical exhibit, but not by any means the least for being mentioned last, is that part which will create object lessons on electrical progress, the historical exhibit. It would be impossible to fully appreciate the greatness of the progress made, and the magnitude of the work of making commercial electricity what it is to-day, without the presence at any exposition of the first crude machinery, the initial appliances by which the electrical current was made a useful force. It is contemplated to have some of the original models, and where this is found impossible, to have reproductions of the models of the apparatus of Morse, Franklin, Vail, Henry and many others of our own country, and those of Ohm, Ampere, Gauss, Siemens and many others of Europe. The department is in correspondence at the present time with those people or governments that have control of museums or institutions of learning where any of this historical apparatus may be, and we earnestly hope to have a full exhibit of these priceless treasures.

It is not contemplated by the national authorities of the Columbian Exposition to offer awards which would have so great an intrinsic value as to attract exhibitors, but it is contemplated to make the standard of excellence so high that the bare acceptance of an exhibit by a department will be a lasting and distinguished honor. In the Electrical Department the space available for exposition purposes will be so small, as compared with the demand, that the greatest judgment will have to be brought into play to decide what exhibits are worthy of a place and what will have to give way. It will be impossible to accept all. Therefore, the presence of an exhibit in the electrical building will be a testimonial of its unusual merit. The awarding committees have determined to have full and exhaustive tests made of all machinery in competitive exhibition by the juries of the different departments, and to publish these tests and the jury findings at the close of the exposition under the authority of the National Commission.

I regret that it is impossible at this time to present figures and definite information as to the prospects and scope of the department. It is yet 16 months before the opening of the exposition, and while an amount of space in the department building has already been applied for in excess of the total amount available, yet we have heard from fewer than one-half of the probable applicants for space. A delicate task is before the department, therefore, and it will not be advisable to discuss the question in detail for some months to come, when I hope to have heard from all the electrical people. I will then be in position to discuss the matter more fully and more in detail in a paper which I shall ask to present.

The Song of the Horse.

Hurrah for electricity, that saves my tired feet
And wheels, with fleet lubricity, the cars along the street!
What wonderful complicity of fate and human brain
Have brought me this felicity of rest from toil and pain?
Ere long that grim monstrosity, the horse car, but in song
Will live, no animosity provoke in waiting throng;
No more will domesticity be marred by meals delayed,
For, with swift electricity, there'll be no car blockade.
Then, whoop for electricity, the era's drawing nigh
That equine infelicity may heave a cosmic sigh—
That man's uncurbed ferocity Electra's flank may goad
And she, in reciprocity, will yank him o'er the road!
With all my lungs' capacity, I'd neigh my joy equine,
For verbal perspicacity is hardly in my line.
Then give the news publicity, the marvel's come to pass;
Whoop-la! for electricity, the horse may go to grass.—*Philadelphia Ledger.*

Judge Jackson, in the Federal court at Nashville, Tenn., on the 19th ult., rendered a decision in the case of the Thomson-Houston Electric Company *vs.* the Capitol Electric Company. He gave judgment in favor of the plaintiff for $54,535.85 on first mortgage bonds, and $26,048.03 due on notes. It was also decreed that the property should be sold as one plant, to be paid for in six, twelve and eighteen months, with interest.

Notes on the Frankfort Electrical Exhibition.

A PAPER READ AT THE SIXTY-FIRST MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, NOVEMBER 24, 1891,

BY CARL HERING.

The list of the international electrical exhibitions which have been held so far, begins with the one in Paris in 1881; this was followed by the one in Munich in 1882, then in Vienna in 1883, and Philadelphia in 1884, which was the last of this annual series of exhibitions. After a lapse of five years, during which time there were none of importance, it was followed by the Universal Exhibition in Paris in 1889; although this was not an electrical exhibition, the electrical exhibits formed such a large and important part that they may well be said to have formed the equivalent of an electrical exhibition. This was followed by the one at Frankfort held this year, which forms the sixth and last, and which is to be followed by the electrical section of the World's Fair in 1893, making the seventh. Among the electrical exhibits made at exhibitions prior to the Paris Exposition of 1881, may be noted the first exhibit of the telephone and a few arc lights run with a Gramme dynamo, both at the Centennial Exhibition in Philadelphia, in 1876. Also a very small electrical exhibit, chiefly of telegraph instruments and apparatus, at the Paris Universal Exhibition of 1878.

The most prominent features at the electric exhibitions were as follows: In the first one at Paris, in 1881, the chief feature was what might be called the birth of the present electrical industry. The most prominent exhibits included large dynamos of proportions thus far unknown; practical systems of distribution of arc lamps in series, and incandescent lamps in multiple arc, and practical systems of telephonic distribution. In Munich the most prominent feature was the electrical transmission of power, about which so much was written, though so little was accomplished. In Vienna, in 1883, and in Philadelphia, in 1884, there were no particularly prominent features, electrical engineering having by that time developed into a steadily growing industry, as distinguished from one developing with spasmodic strides, as in the previous years. In Paris, in 1889, the prominent feature ought to have been alternating current distribution, but owing probably to the absence of certain American and Austrian exhibitors such systems were not as prominent there as their importance and their development at that time would have warranted. The alternating current apparatus of Professor Thomson and his welding machinery were unquestionably the most interesting and novel features at this exhibition. At the Frankfort Exhibition, the most prominent feature was very high tension alternating current transmission, and alternating current motors. What the World's Fair has in store for us is to be seen, but electrical traction will doubtless be among the most prominent of the later developments in the electrical industry.

The two exhibitions in Paris were truly international in character, but in the others, except perhaps in the one at Vienna, there were so few exhibits from foreign nations, that they can hardly claim to have been more than national exhibitions. International electrical congresses were held in Paris in 1881 and 1889, in Philadelphia in 1884, and in Frankfort in 1891; of these, the first did the very creditable work of laying down the admirable system of electrical units and names which stands to-day as the most simple, rational and uniform system of complex units of measurement existing in any branch of engineering. The third congress, in 1889, also did good work in the field. The one in Philadelphia in 1884, and in Frankfort, this year, accomplished practically no international work, leaving all the more to be done at the fifth congress to be held in Chicago in 1893.

The Frankfort Electrical Exhibition was started, I understand, by the Electrical Society of that city; it was conducted by some of the leading business men and electricians of that city, and I believe with some assistance or recognition from the government. It was therefore more of a private rather than a national enterprise. In Frankfort the foreign exhibits were limited to a very few, chiefly from Switzerland, England and the United States, it cannot, therefore, lay much claim to having been international; it certainly was not, so far as representing the state of the art in other countries was concerned. It was an excellent exhibition of the state of the industry in Germany, but that was all.

The general arrangement of the grounds, buildings and exhibits was very creditable. The grounds and most of the buildings were attractively arranged with a view to giving it a pleasing appearance and making it an attractive resort for the public, with as many "side shows" as possible, for which, however, an extra admission was charged. The average price of admission being only 18 cents, and on Sundays 5 cents, it was visited largely by persons who came there for the amusement more than for studying the exhibits. I mention this because without these attractive features it could not have been a financial success. The number of visitors during the six months was somewhat over a million. The attraction afforded by some of the "side shows" may be judged from the fact that of the visitors at the exhibition, one out of every three visited the panorama, a painting of a transatlantic steamer entering New York Harbor; the only electrical feature about it was that in the evening it was lighted by electricity.

Among the popular attractions on the grounds may be mentioned the following: A moderate sized theatre with electric illumination from accumulators and a very complete system for manipulating the lights to produce stage effects. Popular and very fully illustrated lectures were given here every afternoon, while in the evening there was a performance consisting of pantomime or ballet, in which the plot was a senseless, though otherwise amusing mixture of mythology and of the history of electricity from the frog experiments to the crowning glories of the electric light. In a miniature model theatre, the firm of Siemens & Halske exhibited a very complete system of stage illumination, capable of producing very varied and really beautiful stage effects. This exhibit was a very successful one and leaves no doubt that electric light is not only the best, but also the only means for producing such fine illumination effects on the stage. Many of these effects could not have been produced with gas or calcium lights, not to speak of the danger of fire attending such an attempt. The imitation of the sunset, the Alpine glow and the rising of the moon, were particularly fine and in some respects fully equalled those of nature.

On the grounds was an artificial waterfall pumped electrically from the river, with both direct and alternating current motors, and illuminated internally and externally with hidden colored electric lights. The internal illumination was not a success, as had been demonstrated before, both at Paris in 1889, and at Philadelphia in 1884, but the external illumination was quite fine and attractive, though hardly comparable with the really beautiful effects produced in the illuminated fountains in Paris in 1889, by an English firm. The total illumination of the grounds and buildings was somewhat over a million candles. In the telephone building there was a long distance transmission from the Opera House at Munich, a distance of about two hundred miles. Male and female voices could be distinguished from each other and sometimes even the different instruments of the orchestra. Besides this long distance transmission there were also several others from music halls and theatres in the environs, in which the transmissions were very good.

Among the minor popular attractions were the following: A diver working under water by electric light; a sort of artificial race course for children, in which each horse was operated by a separate motor under the track operated from a common platform; an artificial mine, under ground, with mining ventilators and a small railroad; electric elevators, railroads and launches, etc.; a boat with a benzine engine, both made entirely of aluminium produced by an electric process. One of the attractions greatly appreciated by the public was not electrical at all, being a series of workshops in active operation for the manufacture of goods of all kinds, in which the only electric feature was that the machinery was driven by electric motors.

In general, and with but few exceptions, there was one very notable feature to an American about the exhibits and one that is to a certain extent characteristic of the two nations. The Germans are very careful, thorough, indefatigable workers; their work shows thought, intelligence, and a thorough knowledge of the underlying principles (though not necessarily knowledge of what has been done outside their own country), but they appear to lack invention. They will work out, with much trouble and care, the best theoretical conditions (which sometimes lead them to impracticable constructions), but they lack the faculty of invention which suggests new practical conditions and simple ingenious contrivances. The Americans, on the other hand, possess the faculty of invention to a great degree; but their inventions and ideas, although bright and ingenious, not infrequently show the want of a fundamental and thorough knowledge of the subject, or a want of study and care in carrying them out. The numerous rejected or absurd applications in our patent office will show this. These statements are, however, only quite general; there are, of course, many notable exceptions in both cases.

There was another noticeable feature which has its parallel to a certain extent in the watch industry. In America the electrical industry has developed to such a degree that dynamos and motors are made from the same templates and probably often with interchangeable parts. They are kept in stock and installations must be made to suit these standard sizes. I am told that in one of our largest factories, anything different from the regular standard sizes or designs is undertaken with great reluctance and little interest. In Germany, on the other hand, the dynamos I am told, are, as a rule, made to suit the installations and are varied in design to suit the requirements. In numerous cases in which I wished to find out what their usual practice was, it turned out that there was no usual practice; that the exhibit was the first, or among the first of its kind made. In a pattern shop of one of the largest companies I noticed about six different patterns for very large dynamos of about the same output, which had been used for only a few castings, and some for only one. Yet they state that they make a profit, even though the dynamos are very much cheaper than in the United States, while they are often fully as good, if not better. While the one system is more flexible and undoubtedly leads to a more perfect development of the dynamo, the other, although it does to a certain extent retard development, is unquestionably the most practical method when the sales are large, and it will, no doubt, be employed there when the industry assumes the proportions it has assumed here.

In America there is sometimes a tendency to sacrifice quality of work for quantity, which is a natural result of the objectionable practice of awarding a contract to the lowest bidder, and is, therefore, not necessarily a fault of the manufacturers. In Germany much pride is taken in making and keeping one's reputation for doing good work; so much so, that the name of a company and the quality of the work they have done, has perhaps more weight in awarding a contract than the price. The natural result is that work is more creditably and carefully done; there is a greater variety in the systems used, and they are better adapted to suit the special requirements of the particular installations. A noticeable feature, to show the preference for substantial work, is seen in one of the accumulators exhibited. Here, in America, the tendency has been to get the greatest possible output per pound of weight, or, in other words, to put in as little material as possible; the result is that the accumulator here is a frail, delicate object which must be accompanied by a nurse, or its life will not be guaranteed by its maker. In Germany they have discarded this policy to a great extent. The accumulator which is used there most frequently, and much more in proportion than accumulators are used here, is a strong, heavy, hard Plante cell, with plates so thick that they are able to stand without being watched so carefully. The result of this is that many installations and central stations there are equipped with accumulators. I call attention to this particular case as there is no doubt that in the application of storage batteries to central stations they are far ahead of us, and we can learn much from them.

Regarding the nature of the recent progress in the electrical industry as exhibited, it may be said that, excepting the rotary current systems, there was no radically new departure shown in any of the prominent branches. The exhibits, as a rule, showed that the erratic progress made in the earlier years was being replaced by a steady, natural and healthy progress, such as may be expected in any important industry receiving the attention that this one is. Impracticable and absurd ideas are dying a natural death and the wholesome effects of the law of the survival of the fittest are plainly to be seen. Although the progress of the introduction of electric light and power in Germany has been much slower than in the United States, it has been and continues to be a steady progress; the Germans may think twice before they act, but when they do act, they do their work well and thoroughly. New York was the first city to have a large local central station plant for incandescent lights in a small limited district, but Berlin will soon be ahead of New York, if it is not so already, in having an extended, homogeneous, well-planned underground system for supplying incandescent lights to a very large part of the city. It is needless to say that in a well-regulated government, like that of Germany, the government controls the companies, and does not allow itself to be controlled by them. In street lighting and, doubtless, also, in the distribution of power, and the application of motors, they are far behind us, and can learn much from us, but in their manner of introducing complete systems of supplying lights in their cities, we have much to learn from them.

The historical exhibits were quite naturally limited to those of Germans. Great prominence was given to Soemmering, as the original inventor of the telegraph in 1809. His statue was seen in several places, and his original apparatus was exhibited in operation. The original apparatus of Reis, the electric machine of Goethe, and the original apparatus of Hertz, were among the most interesting historical exhibits.

Among the many firms exhibiting, the most prominent was, no doubt, the firm of Siemens & Halske, the largest electrical manufacturers in Germany. Their field is apparently unlimited, as they exhibited creditably in almost all the branches of the electrical industry. They appear to make a specialty of nearly every branch, and in some of them they unquestionably excelled. The firm of Schukert had the next largest exhibit; although not so broad in scope, it was in some respects possibly more creditable. "Helios," who represent the Austrian firm of Ganz & Co., came next in order of size of their exhibits, which was limited entirely to alternating current machines and systems. The exhibits of these three firms, one at each end and one in the middle, occupied the greater half of the machinery hall. The Allgemeine Electricitats Gesellschaft, of Berlin, and the Oerlikon Company, of Zurich, came next in point of prominence. Their joint exhibit of the rotary current power transmission may be said to have excelled the others in point of interest, as it was undoubtedly the most interesting exhibit to the engineer, as well as the most novel.

The exhibitions of dynamos were, as a rule, very creditable, both as to workmanship, and particularly as to absence of sparking at the brushes. It cannot be said that any one firm predominated; there was in fact probably a greater variety of form than at any other exhibition; there were scarcely two alike. A very noticeable feature was that all large machines were multipolar; large bipolar machines apparently do not exist in Germany, and in this respect they are, doubtless, ahead of us. One reason for this is, no doubt, that their large dynamos are almost without exception coupled directly to the engine. This leads to slow speeds and, consequently, to armatures of large diameters, which, of course, excludes bipolar fields. In several prominent cases the armatures were outside of the radial multipolar fields, a practice which I believe is not attempted in this country at all. A happy medium between the two appeared in the large flat ring armature of Schukert, which combines the advantages of both. The largest dynamo was that of Siemens and Halske, having 10 radial poles, around the outside of which revolves a large Gramme ring armature, 10 feet in diameter, whose external surface is bare and acts as the commutator. There are 10 sets of brushes of three each, making 30 brushes to take care of. These dynamos have an output of 600 kilowatts at 100 revolutions, and are the units for their central stations, chiefly for these in Berlin. They state that about 30 of these have been installed. The large alternating current dynamos exhibited were made according to the old models with radial magnets. A very serious objection to this form appears to be that the machines make a very loud humming noise, like that of a very low tuned steam whistle. So loud was this noise that it made conversation difficult, and, in fact, almost impossible in the neighborhood of the large machine, for which reason it was called the "growler" or "grumbler," by the rival exhibitors. Among the more unusual forms of dynamos may be noted the Fritsche continuous current and the Kingdon alternator, having no moving wire, both of which have been described in the electrical journals.

It appears that carbon brushes are limited chiefly to motors and especially to railroad motors, where they appear to have replaced the others entirely. The form of brush almost exclusively used for dynamos is one made of fine copper wire gauze; an important feature being that the fibres run diagonally and not crosswise, thereby avoiding a fraying out at the ends, which was formerly the great objection to them. The chief advantages of this brush are that it is soft and does not "scream" like wire or foil brushes, and that it is easily made; it is strange that it is not adopted in this country. Bearings are, as a rule, made with self-feeding arrangements, like a ring or a wick having an oil reservoir below the bearings. Speeds are almost invariably low and armatures large. Field magnets are generally very short and thick, a natural accompaniment of multipolar fields. Large dynamos are, as a rule, coupled directly to the engine. The workmanship on dynamos was, as a rule, very good, as was also the construction, apart from the design; the design was, in a number of cases, awkward and cumbersome.

Among the various systems of distribution exhibited, the simple 110 volt continuous current system still leads for isolated plants. Alternating current systems are not used for smaller plants, being chiefly limited to central stations. Arc lamps are as a rule run from the same mains as the incandescent, being connected two in series, together with a dead resistance. This resistance represents a dead loss of power, reaching as high as 20 and 25 per cent., but it is a necessary part of such a system, as the lamps often have shunt coils, which would be of no use as a source of regulation, if there were no resistance in series with the lamp. Whatever disadvantages attend such arrangement, it must be said that the arc lamps burn far better there than here. Our restless, flickering lamps contrast very unfavorably with the average lamps seen at this, or at the late exhibition at Paris.

Although the amount of power represented by the alternating current systems was quite great, the number of exhibits of this system were comparatively small, as compared to the others, showing that the continuous current systems still predominate in Germany. The largest dynamos of the alternating type were those of the "Helios" Company (Ganz & Co.) and of the Lauffen-Frankfort transmission. The "Helios" Company uses 2,000 volts and about 83 alternations; arc lamps and small motors were run indiscriminately from their mains. The next most important system of distribution was the accumulator system, in connection with the three wire distribution, an arrangement which I believe is seldom used here, though it seems to be quite common there, judging from the exhibits. In this system one or more dynamos of about 250 volts charge two sets of accumulators in series, each of about 125 volts. These are connected to the three mains of the three wire system, the neutral wire being connected to the middle of the series. By means of switches connected to the outside cells, the voltage for the long and the short feeders may be made greater and less, respectively, and the cells may be cut out when fully charged.

The only important system for arc lamps, was an American exhibit by the Thomson-Houston Company. Such systems may truly be called American, as they do not appear to be used to any extent by the German or French companies, who seem to acknowledge that we are their superiors in this branch. The result of the neglect to develop this system is, that in European cities arc lamps are rarely seen in the streets, at least, when we compare their streets to those of American cities. The series incandescent system, I believe, was not represented at all at this exhibition. It also may be called a truly American system. The five wire system was represented, but it failed to leave a favorable impression, and, as far as I could ascertain, it is in use in a central station in only one city, the home of the company advocating the system.

Among the systems of distribution of power, may be mentioned, above all, the rotary field system of the Lauffen-Frankfort exhibit. It is truly a system of distribution as compared to a mere system of transmission. Next in interest, were the alternating current motors run from the "Helios" Company's system. They were mere alternating current machines, with a rectified current in the field, obtained from a commutator. They appear to have a dead point, at which they will not start. They make some noise at starting, and there are more or less brilliant arcs at the commutator until they run sychronously, but after that they appear to run well. Motors from one to five horsepower will start in from 6 to 28 seconds.

Among the systems of simple transmission of power as distinguished from systems of distribution, the largest was a 2,000 volt continuous current system exhibited by Lahmeyer. The receiver in this system was an ingenious continuous current transformer of the motor dynamo type. The system of switches for starting, controlling and regulating the power and for protecting the apparatus, as well as the attendants, was very complete and very creditable to the designer, but the whole system failed to show any material advantages over the alternating current systems; on the contrary, it left the impression that it was inferior. Besides these systems, there were also a few motors run with a two phase rotary field current using four wires by Schukert. These motors were started unloaded, and without a field current; the latter, obtained from a commutator, was switched on when the motor had reached synchronism.

The exhibits of electric railroads were meagre, and with one exception (the Budapest system) they were unsatisfactory to an American, as they were experimental systems as distinguished from normal systems. In this branch they have much to learn from us.

Among the transformers there was apparently nothing of particular interest. The firm of "Helios" have abandoned the old firm of Zipernowsky-Deri for Faraday transformers, and have adopted one like the usual forms, in which the disposition of the coils is a more practical one. Motor-dynamo transformers or dynamotors were quite frequently seen and appeared to be very much more frequently used than here.

[The remainder of the paper was a verbal description of some of the more prominent exhibits, accompanied by slides showing a number of interior and exterior views of the grounds and buildings, and detailed views of some of the exhibits, more particularly of the Lauffen-Frankfort transmission experiment, most of which have been published in the foreign and domestic journals, and are, therefore, omitted here at the suggestion of the author.—ED. REVIEW.]

KINDRED INTERESTS

The Zucker & Levett Chemical Company, 40 Murray street, New York, are sending out a little pamphlet descriptive of the Hercules electric motors and dynamos.

The Paraffine Paint Company, San Francisco, is a sister company of the Standard Paint Company, 2 Liberty street, New York, and manufactures the popular P. & B. insulating compounds on the Pacific coast and for the territory west of the Rocky Mountains.

The method of giving away goods as a business policy to secure orders is a novel one in the electrical business, and the Central Electric Company are entitled to the credit of this departure, which has been happily received by the trade, and has netted good results thus far.

The J. E. Bolles Wire Works, of Detroit, have recently got settled in their new factory, which is a handsome three story brick building, 200 feet long by 60 feet wide, with a wing 80x80 feet. The office and stock house are 40x60 feet and four stories high. They also intend to build a new foundry as early as possible in the Spring, which will be 70x150 feet. They are now employing about 150 men, and have the contract for the structural iron work of the new building now being erected for the Detroit Electrical Works.

The Wainwright Manufacturing Company, of Massachusetts, has made the following recent sales: Grand Trunk Railway, of Canada, one 600 horse-power; Powers' Hotel, Rochester, N. Y., two heaters of 300 horse-power; Barnett & Record, Minneapolis, Minn., two 350; Pomeroy & Middleport Electric Co., Pomeroy, O., one 125; Goshen Electric Light Co., Goshen, N. Y., one 125; Newport News Electric Light Co., Newport News, Va., one 200; Wilmington City Railway Co., Wilmington, Del., one 1,000; Fraser & Chalmers, Chicago, Ill., one 800; American Spool, Bobbin and Shuttle Co., Boston, one 150; Derby Street Railway Co., Derby, Conn., one 125; Russell & Co., Massillon, O., seven 885; Pittsburgh, Allegheny & Monongahela Traction Co., Pittsburgh, Pa., one 400; Buckeye Engine Co., Salem, O., three 280; Stearns Manufacturing Co., Erie, Pa., one 100; Mount Morris Electric Light Co., New York, N. Y., one 200; Mahanoy, Shenandoah, Girardsville & Ashland Street Railway Co., Rappahannock, Pa., one 300; Johnson Wheel Co., Freeport, Ill., one 100; George F. Blake Manufacturing Co., East Cambridge, Mass., three 210; Montana Electric Railway Co., Helena, Mont., one 250; Hughes Steam Pump Co., Cleveland, O., three 180; Edward Simon & Bros., Newark, N. J., one 100; Arbuckle, Ryan & Co., Toledo, O., three 285; Phœnix Iron Works Co., Meadville, Pa., one 500; and 35 small heaters, amounting to 1,550. Among the sales of expansion joints the following large orders appear: Pabst Brewing Co., Milwaukee, Wis., 91 joints; Delaware, Lackawanna & Western Railway, Jersey City, N. J., 14; Grant Locomotive Works, Chicago, Ill., 12; Blue Island Engine and Steam Heating Co., Blue Island, Ill., 3; New York Central & Hudson River Railroad, New York, N. Y., 4; U. S. Government Cruiser "Detroit," 2; U. S. Government Cruiser "Montgomery," 2.

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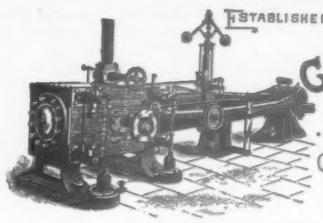

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON DECEMBER 29, 1891.

465,832 System of synchronism for telegraphy; Gilbert A. Cassagnes, Paris, France.

465,844 Electric railway; Julius Emmner, Jr., Washington, D. C., assignor, by direct and mesne assignments, to Philip T. Dodge, trustee, same place.

465,853 Electric machine; Thomas H. Hicks, Detroit, Mich., assignor of two-thirds to George F. Case and E. D. Richmond, same place.

465,854 System of electrical distribution; Thomas H. Hicks, Detroit, Mich., assignor of one-half to George F. Case, same place.

465,855 465,994 Alternating current dynamo; Thomas H. Hicks, Detroit, Mich., assignor of one-half to H. L. Obetz, same place.

465,866 Sliding clamp for electric welding apparatus; Hermann Lemp, Lynn, Mass., assignor to the Thomson Electric Welding Co. of Maine.

465,886 Electric railway; Henry S. Pruyn, Hoosick Falls, N. Y.

465,888 Covered electric conductor; Thomas L. Reed, Providence, R. I.

465,949 Electric cane; Alfred W. Roovers and Alexander H. Roovers, Brooklyn, N. Y.

465,958 Lightning arrester; Alexander Wurts, Pittsburgh, Pa., assignor to the Westinghouse Electric and Manufacturing Co., same place.

465,961 Insulator; Giuseppe S. Albanese, Orange, N. J.

465,970 Armature connection for motors or generators. 465,972 Phonograph. 465,973 Armature for dynamos or motors; Thomas A. Edison, Llewellyn Park, N. J.

465,971 Means for transmitting signals electrically; Thomas A. Edison, Menlo Park, N. J.

465,981 Electrical pyrotechnics; Pierre C. E. Champion, Paris, France.

465,988 Cut-out; Henry W. Fisher, Pittsburgh, Pa.

465,989 465,990 Signal transmitting apparatus and system; Henry A. Chase, Boston, Mass., assignor to Albert Watte, same place.

465,991 Electric signaling apparatus; Frederick W. Cole, Newton, Mass.

465,997 Electrical switch; George B. Martratt, Troy, assignor of one-half to Charles E. Martratt, Albany, N. Y.

465,999 Brake for electric motors; Alton J. Shaw, Muskegon, Mich.

466,011 Electric pendulum clock; Henry Phillips, New York, N. Y.

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